

MENTAL IMPROVEMENT

OR TYLE

BEAUTIES AND WONDERS

OF

Nature and Art.

IN A SERIES OF

STRUCTIVE CONVERSATIONS.

BY

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Author of *Leisure Hours*, &c. &c.

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P R E F A C E.

THE art of exercising the faculty of thinking and reflecting upon every object that is seen, ought to constitute a material branch of a good education; but it requires the skill of a master's hand, to lead the minds of youth to the habit of observation. Dr. Watts says, that there are four methods of obtaining knowledge: observation, reading, conversation, and meditation. The first lies within the compass even of children; and from the early dawn of reason, they should be accustomed to observe every thing with attention that falls under their notice. A judicious instructor will find matter for a lesson among those objects that are termed common or insignificant. How little this is generally the case, may be collected from the ignorance, not of children only, but sometimes of youth, who, although they have obtained a considerable degree of classical learning, are unacquainted either with the materials of those things they daily use, or the methods of manufacturing them. The form and appearance of substances are so much changed by the effects of art, that it would be impossible for a mind unpre-

pared by instruction, to conceive the original material of many things that are in the most common use. Would any child suppose that the cloth, of which her frock is made, is composed of the fibrous parts of a green plant; or that the paper on which she draws is the same substance, wrought into a different form: that the transparent glass, out of which she drinks, was once a heap of sand and ashes; or that the ribbon she wears is the product of an insect? The design of the following little work is to excite the curiosity of young persons on these subjects, by furnishing information on a few of the most obvious. The form of dialogue has been adopted, as the best suited to convey instruction, blended with amusement; being desirous that it should be read rather from choice than compulsion, and be sought by my young readers as an entertainment, not shunned as a mere dry, preceptive lesson.

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The Persons.

MR. HARCOURT.

MRS HARCOURT.

SOPHIA, AGED SIXTEEN.

CECILIA, AGED TWELVE.

**AUGUSTA, AN OCCASIONAL VISITOR,
AGED TWELVE.**

CHARLES, AGED FIFTEEN.

HENRY, AGED NINE.

Mental Improvement, &c

CONVERSATION

Sophia and Cecilia.

SOPHIA.

HOW happy are we, my dear sister, to be blessed with kind parents, who devote so much time to our instruction and amusement ! with what tenderness do they listen to our conversation, and improve every subject that arises, to our advantage !

CECILIA.

I am never so happy in any other company ; they have the art of rendering in-

struction and study agreeable. Though I tenderly love my governess, I feel such a superior attachment to my mamma, that I am not able to express it; and I am sure Mrs. Selwyn will not blame me for it, for she always advises me to look up to my father and mother, as my best and kindest friends.

SOPHIA.

Mrs. Selwyn, our worthy governess, is too wise and discreet to be jealous of our preferring our parents to every body; she would sooner direct us to regulate our affections properly, and undoubtedly give them the first place.

CECILIA.

What bitter repentance do I feel, when I have done any thing to offend them, particularly when I am inattentive to their instruction! How comes it, Sophia, that I am so often idle, and my thoughts wander from what I am about, when I really intend to be good?

SOPHIA.

SOPHIA.

You are very young, my dear, and mamma says that the habit of attention is difficult to form; but that by steadily endeavouring to fix our thoughts on one object, we shall every day find it more easy: and though it may cost us some pains at first, let us remember what we owe to the affectionate care of such a mother, and give our whole attention, when she condescends to instruct us.

CECILIA.

I often pity poor Augusta; she has no mamma, and her governess seldom teaches her any thing but her regular lessons.

SOPHIA.

I both love and pity her: she is of a good disposition; but has not received the same advantages that we have: her papa is engaged in business, and leaves her wholly to the care of her governess, who takes but little pains with her.

CECILIA.

Let us desire mamma to give us leave to invite her often to be present at our evening
B 2 conversations.

conversations. Papa has promised to give us some account of various manufactures : all will be new to her, she will be delighted, and it will be a means of supplying her with some of the instruction she wants.

SOPHIA.

Mamma will be very willing, I dare say : she takes pleasure in doing good, and is never better pleased than when she has an opportunity of improving young people.

CECILIA.

I long for the evening, when we are all to meet in the study. I wonder what object papa will have prepared for us. My brothers, too, are to be of the party ; and when we have been separated all day, it is such a pleasure to meet them, that I cannot say how delighted I am with the thoughts of it.

SOPHIA.

It is almost time to attend our writing master ; and do not let us forget the terms of admission to these agreeable evening conversations : attention to our lessons in the day, and obedience to the commands of our dear
mamma,

Gamma, are the only methods of obtaining a seat at night. Papa will not confine the subject of his lectures wholly to manufactures, but intends to explain the nature of the materials of what we wear and use, which will frequently lead him to describe objects of natural history, a study of which I am particularly fond.

CECILIA.

We are also sometimes to supply a subject. Books are to be given us, that we may be prepared. I wish I may be able to answer properly.

SOPHIA.

Hark ! the bell rings for writing ; we must attend the summons.

CONVERSATION II.

*Mr. Harcourt, Mrs. Harcourt, Augusta,
Sophia, Cecilia, Charles, and Henry.*

MRS. HARCOURT.

MY dear Augusta, I am glad to see you; my girls tell me you desire to be of our party when we meet of an evening. Your company will be always agreeable to me, and I hope our conversation will be instructive to you.

AUGUSTA.

I accept the invitation with pleasure; but I hope to receive entertainment as well as instruction; for I shall never be able to attend to a long, dry lecture, without some amusement to render it palatable.

MR. HARCOURT.

I have chosen the Whale for our subject to-night, and the information it affords, I expect, will be new and wonderful to you all.

CHARLES.

Is not the whale found in the seas towards the north pole?

MR. HARCOURT.

Yes, my dear, they chiefly inhabit the seas towards the north pole; though many whales are caught in the South Sea, towards that pole; but the chief fishery has been near the coast of Spitzbergen, Nova Zembla, and Greenland; where many ships from this country go every year, for the sole purpose of catching whales.

MRS. HARCOURT.

We may admire the goodness of Providence, who leaves not the most obscure corner of the globe without its peculiar riches. These countries, which scarcely supply food for their wretched inhabitants, and are covered with snow full nine months in the year, are visited by people from distant parts of the world, who brave every danger, for the sake of taking the whales, which are found in their seas.

CECILIA.

I cannot think what use they can be of, to tempt people to go so far for them.

MR. HARCOURT.

You will find that they supply several useful

ful articles for our convenience. Your stays, for example, would not be so well shaped without whalebone,

CECILIA.

Are the bones that stiffen our stays really the bones of whales?

MR. HARCOURT.

The substance called whalebone, adheres to the upper jaw, and is formed of thin parallel laminae, called whiskers : some of the longest are four yards in length ; they are surrounded by long, strong hair, to guard the tongue from being hurt, and also to prevent the return of their food, when they discharge the water out of their mouth.

HENRY.

Whiskers four yards long ! how fierce the whale must look ! pray what size is he himself ?

MR. HARCOURT.

The common whale is the largest of all animals, of whose history we have any certain account. It is sometimes found ninety feet long, and those which inhabit the torrid zone are said to be much larger. The size of
the

the head is about one-third of the whole fish ; the under lip is much broader than the upper, which is narrow and oblong ; the tongue is a soft, spongy, fat substance, sometimes yielding five or six barrels of oil ; the gullet or swallow is very small for so large an animal, not exceeding four inches in width ; but that is proportioned to the food it eats, which is a particular kind of small snail ; or, as some say, it varies its repast with the Medusa, or sea blubber, an insect which is found in the sea.

SOPHIA.

Is not the whale a fish of prey then ? I thought it would devour men, if they unhappily fell in its way.

MR. HARCOURT.

They are quite harmless and inoffensive to every thing but insects. The only danger to be apprehended from them is the starting of a plank in a ship, or the overturning of a boat with their huge bulk.

AUGUSTA.

Oh, terrible ! what can induce men to incur such dangers, when they may stay quietly at home and enjoy themselves.

MRS.

MRS. HARCOURT.

There are many strong reasons that prevail with thousands to undergo a life of hardship, toil, and danger. The necessity of earning a living, to which you, who are brought up in the enjoyment of plenty, are strangers, is one strong inducement.

SOPHIA.

But I would chuse some easier employment : a gardener is an agreeable life.

MR. HARCOURT.

But you do not reflect that all men cannot be gardeners ; there is employment for but few in that line. Providence has wisely endued mankind with as great a variety of inclinations and pursuits, as there is diversity in their persons : some show a very early inclination for a sea-life, from which no danger can deter them, or persuasions prevail with them to resign ; which appears to be implanted for the purpose of promoting an intercourse between the inhabitants of distant countries, from which each party may reap advantage, by interchanging the superfluous
produce

produce of distant climes, and exercising the mutual good offices of love and kindness. But to return to the whale. It has two orifices in the middle of the head, through which it spouts water to a great height, and, when it is disturbed or wounded, with a noise like thunder. Its eyes are not larger than those of an ox, and placed at a great distance from each other. There is no fin on the back, but on the sides; under each eye are two large ones, which serve it for rowing. The colour varies, the back of some being red, others black, and another variety is mottled: the belly is generally white. They are extremely beautiful in the water; the skin is very smooth and slippery. Under the skin the whale is covered with fat or blubber, from six to twelve inches thick, which sometimes yields from one to two hundred barrels of oil. All Europe is supplied with oil for lamps, and many other purposes, from this blubber. The flesh is red and coarse, somewhat like beef; the Greenlanders eat it, and the Icelanders soak it in sour whey.

CHARLES.

It must be very disagreeable food. I should think the oil would make it very greasy and strong.

MR. HARCOURT.

So it does ; but the poor people, who live in countries so far north, have but little variety of meat to tempt their appetite. In winter, as your mother has already remarked, the ground is covered with snow, and affords no vegetation but a little moss, which is found on the bodies of trees ; consequently, the larger animals, such as cattle, &c. cannot subsist there. The rein-deer is peculiar to those parts, and supplies his master with a scanty provision during that dreary season ; but as they are valuable for many purposes, they are unwilling to kill them but from necessity. The flesh of the whale is therefore reckoned a dainty ; which may afford us a lesson to be contented with beef and mutton, and to discourage that spirit of gluttony and sensual indulgence, that prevails too glaringly at the table.

tables of the rich ; who are seldom satisfied with one or two plain dishes, but cover their tables with a profusion that invites a false appetite, and wastes the good things that are provided for our use.

CHARLES.

Do whales ever stray so far from their usual haunts, as to be found on our coasts? It would give me great pleasure to see one.

MU. HARCOURT.

There have been instances of a few, that have been left at low water on shore, but they occur but seldom : when it happens, they are called royal fish, and become the property of the king and queen. Notwithstanding its vast size, the whale swims swiftly, and generally against the wind. The female brings but one, or at most two young ones at a time, which are nine or ten feet long : they suckle their young, and, if pursued, show the same maternal solicitude for the preservation of their offspring, as land animals, by wrapping them up in their fins, close to their bodies.

SOPHIA.

Pray, does the whale yield any thing that is useful to man, except oil and whalebone?

MR. HARCOURT.

Yes; spermaceti is prepared from the oil that is found in the head of a whale. It is cleansed, whitened, and brought to a consistence, by repeatedly boiling it over a gentle fire; when cold it is cut with a knife into flakes, and is used as a medicine in complaints of the lungs: it serves also for candles, which are but little inferior to those made of wax.

CHARLES.

I cannot imagine how they contrive to catch and manage an animal of such prodigious size.

MR. HARCOURT.

No animal is so large or powerful, but must yield to the superior sagacity of man. The method of taking whales is truly curious, and I shall have pleasure in entertaining you with a recital of it.

ALL.

ALL.

Pray begin; we are all attention.

MR. HARCOURT.

The fleet usually set sail about the beginning of April, and steer northward, till they reach about the 75th degree of north latitude, where they usually begin to meet with the ice. It is among the huge heaps of ice, that float about in these seas, that they find the whale, and there most of the vessels take their station for the fishing. In the English whale fishery, every ship has six or seven boats belonging to it, each of which has one harpooner, one man to steer, one to manage the line, and four seamen to row it; each boat is provided with two or three harpoons, several lances, and six lines fastened together, each one hundred and twenty fathoms long. To each harping iron is fastened a strong stick, about six feet long; and a soft, pliable line, of as many fathoms, called the fore gauger, which is fastened to the lines in the boat. The instrument with which the whale is struck is a harping iron, or javelin, pointed
with

with steel, in a triangular shape, like the barb of an arrow. The harpooner, upon sight of the fish, flings the harping iron with all his might against its back; and if he be so fortunate as to penetrate the skin and fat into the flesh, he lets go a line fastened to the harping iron, at the end of which is a gourd, which, swimming on the water, discovers where the whale is: for, the minute he is wounded, he plunges to the bottom, commonly swimming against the wind; and this is the moment of danger, lest he should outrun the length of the line, and pull the boat after him into the deep. To guard against this inconvenience, a man is fixed by the line with a sharp knife, ready to cut it in a moment, in case of necessity. If the whale return for air to breathe, the harpooner takes the opportunity to give him a fresh wound, till, fainting by loss of blood; from repeated wounds, the men seize that moment for approaching him, and thrusting a long steel lance under his gills, into his breast, and through the intestines, soon dispatch him. When the carcass begins to
float.

float, they cut holes in the fins and tail, and tying a rope in them, tow him to the vessel, where he is fastened to the larboard side of the ship, floating upon his back, almost level with the sea.

CHARLES.

What wonderful skill and dexterity are requisite in a Greenland sailor! I should like to make one voyage with them.

MRS. HARCOURT.

Your curiosity and ardour are excited by the account your father has given us of their expeditions; but you are not aware of the hardships they undergo from the severity of these northern climates.

AUGUSTA.

I have been accustomed to look with contempt on such people, as greatly my inferiors but, for the future, I will try to respect everybody whose employment is useful.

MR. HARCOURT.

You will do right; for a Greenland whale catcher is a much more valuable member of society, than an idle man of fortune; who lives

on the labours of others. In order to take the blubber or fat, from which they procure the oil, and the fins, as they are called, or whalebone, several men get upon the fish, equipped with a kind of iron caulkers or spurs, to prevent their slipping, and cut off the tail, which is hoisted on deck, and then cut square pieces of blubber, weighing two or three thousand pounds, which are hoisted on board with the capstern, where each piece is again divided into smaller pieces, of two or three hundred pounds weight; then these are thrown into the hold, and left for a few days to drain. When all the blubber is cut from off the belly of the fish, it is turned on one side, by means of a piece of blubber left in the middle, called the cant, or turning piece; thus they cut out the sides in large pieces, which they call hockies. The next operation is to cut out the two large jaw bones, situated in the under lip, which, when hoisted on deck, are cleansed, and fastened to the shrouds, with tubs placed under them, to catch the oil which they discharge. The

Mental Improvement.

carcase is left to float, and supplies food for Greenland birds, call'd mellemuck, &c. After the pieces of blubber have lain a few days in the hold, they hoist them on deck, cut them in small pieces, and put them through the bung-holes into their casks; one of the largest fish will fill more than seventy butts. The produce of a good large whale is valued at about one thousand pounds. When thus richly laden, they begin to sail home-wards with their spoil: on their return, the fat is to be boiled, and melted down into train-oil. The whale-fishery begins in May, and continues through the months of June and July. Whether the ships are successful or not, they must come away, and get clear of the ice before the end of August.

SOPHIA.

I thank you, my dear papa, for this very entertaining account. I shall never see a piece of whalebone, but I shall think of the labours and difficulties of the poor Greenland sailors.

Mental Improvement.

CHARLES.

I admire the courage and ingenuity,
those who first attempted to catch whales.

MR. HARCOURT.

Probably accident discovered the use that
might be made of them, and induced some
needy, bold adventurer, to make the attempt;
but many must have been the hazards and
disappointments, before the art was reduced
to a system, as it is now. Rude and im-
perfect is the beginning of all knowledge.
Perseverance and experience have contri-
buted more than genius, to the discovery
of things useful, to accommodate the life of
man.

MRS. HARCOURT.

Much is due to the man who first ventured
his life to procure so useful a commodity as
train oil, without which, many must pass a
long, dreary winter's night, without even the
cheering rays of a lamp.

HENRY.

But, mamma, they can buy candles.

MRS. HARCOURT.

Candles, indeed, are very useful ; but oil is cheaper, and there would not be a sufficient quantity of tallow to light our streets at night. All the cities in Europe are lighted with oil, which is a great accommodation to their respective inhabitants.

CECILIA.

Are there no other fisheries you can give us an account of, papa ?

MR. HARCOURT.

Yes, my dear ; the cod, herring, and salmon fisheries are very useful and extensive, and employ a great number of hands : but our conversation has held long enough for one time ; we will reserve them for the subject of another evening.

MRS. HARCOURT.

It is almost supper time, and little Henry seems ready for bed.

HENRY.

Indeed, mamma, I am not very sleepy, and could sit a great while longer to hear papa tell

us more about these huge whales, and mountains of ice.

MRS. HARCOURT.

I will oblige you another time. It is too late now. Adieu, my dear children.

CONVERSATION III.

Mr. and Mrs. Harcourt, Augusta, Sophia, Cecilia, Charles, and Henry.

CECILIA.

WE have all waited, with the greatest impatience, for the hour of meeting. If the cod and herring fisheries afford to us as much entertainment as the catching of whales, we shall not soon be tired.

MRS. HARCOURT.

I am glad to hear you were pleased with last night's conversation; it is a proof that your minds are capable of relishing rational amusement. An early habit of trifling is difficult

difficult to be subdued, and should be carefully avoided: thousands are rendered unhappy by it; for having never been accustomed to exercise their faculties, as they grow up, they find every thing fatiguing that requires reflection, and as the mind cannot rest wholly inactive, they fly from one trifling, useless pursuit, to another; always tired of themselves, and rendering no benefit to others: but a well-regulated mind is marked by the judicious disposal of time, converting even amusement into instruction. Nature and art present so many objects, calculated to amuse and interest, that none but the idle need want a succession of employment.

AUGUSTA.

Pray, have the kindness to instruct me how to fill up my time. I am often so much at a loss what to do with myself, that I wish for night, to put an end to the long day. As soon as my lessons are over, (and nothing can be more tiresome than they are,) I am without employment, and wander about, without knowing what to do with myself: My go-

verness says that I must not be troublesome to her after I have learned my task : so I have nobody to converse with, nor any thing to amuse me, but playing about till I am tired.

MRS. HARCOURT.

Come to us every evening. I hope our conversations will furnish you with many sources of entertainment for your leisure hours. I am willing to point out whatever may occur worthy your further attention, and by strictly adhering to a few simple rules, you will find the day become as short as you wish it.

AUGUSTA.

Pray give me these rules. I shall willingly adopt them.

MRS. HARCOURT.

Perhaps it will not be so easy, at first, as you imagine : ill habits are difficult to surmount ; but by degrees it will become familiar, and in time agreeable. In the first place, never be unemployed ; read, draw, work, walk, and accustom yourself to observe with attention every thing you see : consider how it is
made, .

made, what the materials are, and from whence they come. If you are unable to discover the answers, keep a little book, and make a memorandum of what you want to know, and we will endeavour to give you information. This alone will fill many an hour, that now passes tediously away.

AUGUSTA.

I thank you for these directions, and will begin to-morrow ; but I have hindered Mr. Harcourt from beginning his account of the cod.

MR. HARCOURT.

The cod is a fish of passage, and is found from eighteen inches to three or four feet long, with a great head, and teeth in the bottom of the throat ; its flesh white, its skin brownish on the back, and covered with a few transparent scales. It is excellent when fresh ; and if well prepared and salted will keep a long time. Salt-fish, or stock-fish, commonly eaten in Lent, is cod thus prepared. There are two kinds of salt cod, the one called green or white, the other dried or cured. The most

essential thing in the green cod fishery, is the skill of the persons employed to open the fish, to cut off the heads, and to salt them, upon which last the success of the voyage chiefly depends. The principal fishery for cod is on the banks of Newfoundland, in North America; and the best season, from the beginning of February to the end of April, when the cod, which during the winter had retired to the deepest part of the sea, return to the bank and grow very fat. Each fisher takes but one cod at a time; yet the more experienced will catch from three hundred and fifty to four hundred every day. This is a very fatiguing employment, both on account of the weight of the fish, and the extreme cold which reigns on the bank. They salt the cod on board. The head being cut off, the belly opened, and the guts taken out, the salter ranges them in the bottom of the vessel, head to tail, and having thus made a layer of them, a fathom or two square, he covers them with salt; over this he places another layer of fish, which he covers as before;

fore; and thus he disposes all the fish of that day, taking care never to mix the fish of different days together. By the time they have lain three or four days thus to drain, they are removed into another part of the vessel, and salted again; then they are left untouched till the ship has got its load, unless they put them in barrels for the conveniency of room.

SOPHIA.

The curing and taking of cod must be less disagreeable and dangerous than whale-catching. I had no idea that the catching of fish alone employed so many men.

MRS. HARCOURT.

We are apt to use and consume the necessities and conveniencies of life without reflecting on the pains and labour necessary to obtain them. The smallest domestic accommodation is frequently not to be had, without the assistance of several hands; a pin or needle, for instance, employs a great number of workmen, before it is brought to the degree of perfection in which we receive it. And the supply of a common table, if we consider

the resources from which it is drawn, most probably employs the time and labour of thousands. But we interrupt your father from proceeding: this subject may be resumed another time.

MR. HARCOURT.

In the fishing for dry cod, vessels of various sizes are used, though such are generally chosen as have large holds, because this kind of fish encumbers more than it burthens. As cod can only be dried by the sun, the European vessels are obliged to put out in March or April, in order to have the benefit of the summer for drying. Indeed the English send vessels for cod later, but they only purchase of the inhabitants what had been caught and prepared beforehand: in exchange for which, we carry them meal, brandies, biscuits, pulse, molasses, linen, &c. The fish chosen for this purpose, though the same species as the green cod, is yet much smaller. As soon as the captains arrive, they unrig all the vessels, leaving nothing but the shrouds to sustain the masts; and, in the mean while, the mates provide

provide a tent on shore, covered with branches of fir, and sails over them, with a scaffold, fifty or sixty feet long, and about one-third as broad. While the scaffold is making ready, the crew are fishing, and as fast as they catch, they bring the fish, open them, and salt them on moveable benches; but the main salting is performed on the scaffold, called flake. When the fish have taken salt, they wash them, and lay them on piles on the galleries of the scaffold, to drain them: when sufficiently drained, they are ranged on hurdles, a fish thick, head against tail, with the back uppermost; observing, while they lie thus, to turn and shift them four times every twenty-four hours. When they begin to dry, they lay them in heaps of ten or twelve a piece, to retain their warmth, and continue to enlarge the heap every day, till it becomes double its first bulk. At length they join two of these heaps into one, which they turn every day as before: lastly, salt them over again, beginning with those that had been salted first, and in this state lay them in huge piles,

big as hay-ricks ; and thus they remain till they are carried on ship board, where they are laid on branches of trees, disposed for that purpose, in the bottom of the vessel, with mats around them, to prevent their contracting any moisture. There are four kinds of commodities drawn from cod ; the zounds, (which is a jelly-like substance, that covers the inside of the main bone,) and the tongues, are salted at the same time with the fish, and barrelled up for eating ; the roes or eggs being salted and barrelled, are useful to cast into the sea, to draw fish together, particularly pilchards ; and lastly the oil, which is used in dressing of leather. And thus, by the art and ingenuity of man, every part of this fish, that can be serviceable, is put to use ; and by his skill in curing and drying it, a large supply of wholesome provision is preserved, which must otherwise be lost. Nor is this care bestowed on the cod alone ; the herring supplies food to vast numbers of families, especially the poorer sort, to whom they are a great relief, when other provisions are dear. But
perhaps

perhaps you are all tired of this subject, and wish to hear no more concerning the catching of fish; but if that be not the case, the herring, though a small fish, will furnish us with wonders almost as extraordinary as the whale.

HENRY.

I am the youngest of the company, and I am not at all tired.

CHARLES.

You surprise me by talking of wonders concerning the herring; I have seen many of them, but never observed any thing in them to excite my attention, beyond fish in common.

MR. HARCOURT.

It is not any thing remarkable in the construction of the individual fish, to which I allude, but to the prodigious numbers in which they assemble, at certain seasons of the year. About the beginning of June, a shoal of herrings, in bulk not less than the whole extent of Great Britain and Ireland, comes from the north, on the surface of the sea :
their

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their approach is known to the inhabitants of Shetland (an island to the north of Scotland,) by several tokens in the air and water, as by the birds, such as gannets, &c. which follow, in order to prey upon them; and by the smoothness of the water. It is not certainly known whence they come, though it is probable that their winter rendezvous is within the arctic circle, where the seas swarm with insect food in greater abundance than in our warmer latitudes. They cast their spawn when they arrive in these seas; for they come to us full, and are shotten long before they leave us. The great shoal divides into columns of five or six miles in length, and three or four in breadth, reflecting, in bright weather, as they pass, many splendid colours.

SOPHIA.

Well might you say you had wonderful things to relate; I had formed no idea of shoals of fish of such prodigious extent. The astonishing particulars we have already heard, make me suppose that the sea and its produce,
woul

would furnish us with an inexhaustible fund of entertainment.

MR. HARCOURT.

The subject is too extensive for our limits: the wonders of the deep have not yet been fully explored; but the most obvious particulars, that are ascertained, I shall with pleasure relate, as they illustrate and confirm our notions of the wisdom and goodness of that divine Being, who careth for all the works of his creation, and has provided for the respective wants of each.

CECILIA.

Pray, papa, what kind of fish is the herring? I am not at all acquainted with it.

MR. HARCOURT.

The herring is a small salt-water fish, with a bluish back, and a white silvered belly. It is commonly said that nobody ever saw a herring alive, they die so immediately on being taken out of the water; but there have been instances to the contrary. By what I have already told you, you will perceive that the herring is a fish of passage: they go chiefly
in

in shoals, and are fond of following any fire or light; indeed, as they pass, they resemble a kind of lightning themselves, their colours glancing against the sun. The method of pickling and curing herrings is simple: there are two ways of doing it; the one makes white or pickled herring, the other what is called red herring. The white or pickled herring is prepared by cutting open and gutting the fish, as soon as it is taken out of the water, but the melts and roes are always left in; they are then washed in fresh water, and left for twelve or fifteen hours in a tub full of strong brine, made of fresh water and sea salt. They are then taken out and drained, and when well drained, put up in barrels, disposed evenly in rows or layers, pressed well down, and a layer of salt strewed over them at top and bottom. After washing, gutting, and salting the fish, as above, when they intend to make them red herrings, they string them by the head, on little wooden spits, and hang them in a kind of chimney, made for the purpose; and when the chimney is filled, which
generally

generally requires ten or twelve thousand fish, they make a fire underneath, of brushwood, which yields much smoke, but no flame, which mostly dries them sufficiently in twenty-four hours: they are then barrelled for keeping. These are the most important fisheries, and employ by far the greatest number of people; though there are many poor men who live on the sea coasts, whose scanty subsistence depends on the dangerous and precarious employment of fishing: a little boat is their chief treasure, in which they venture out in rough and boisterous weather, when the pressing wants of their family urge them to the undertaking.

MRS. HARCOURT.

Their danger and hardships are increased by being obliged to struggle with rough weather and the storms of winter, that being the principal season for fishing.

CÆCILIA.

The sufferings of the poor are very great on shore, in cold weather: their miserable
huts

huts and tattered clothes, scarcely defending them from the sharpness of the air; not to mention their scarcity of fuel. I wonder how they support such hardships.

MRS. HARCOURT.

Aged persons and infants sometimes sink under these difficulties; but those in middle life, who are able to use exercise, support them with less injury. Let these reflections instruct us to feel for the wants of others, and endeavour to relieve them, by retrenching our superfluous indulgencies. They should inspire us at the same time with gratitude to the Giver of all Good, for the numerous blessings he has allotted to us, above many others of our fellow-creatures. With thankful acknowledgment, let us close the day, and each one retire to repose.

CONVER.

CONVERSATION IV.

CHARLES.

I HAVE found the subject of the fisheries so new and entertaining, that far from being tired of them, my curiosity is raised to hear more of them. When you returned from Ireland, I think you mentioned having visited the salmon fisheries : be so kind as to give us the particulars you remember of them.

MR. HARCOURT.

The salmon is a very curious fish ; its instincts and habits are well worth our attention. The principal salmon leaps, (as they are called,) in Ireland, are at Colerain, and at Ballyshannon, which is a small town situated near the sea, with a bridge of fourteen arches over a river, which at a small distance falls down a ridge of rocks about twelve feet, and



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at low water forms a very picturesque cascade.

HENRY.

Do the salmon abound in that river? It must be very pretty to see them tumble down the waterfall.

MR. HARCOURT.

Almost all the rivers, lakes, and brooks in this island afford great plenty of these fish; some during the whole year, and some only during certain seasons: they generally go down to the sea about August and September, and come up again in the spring months: and, what is very remarkable, the same fish always come back to the same river, so that the owners of the fishery are not afraid of losing their fish.

SOPHIA.

Fish appear so stupid, and void of intelligence, that extraordinary instincts in them strike one with more wonder than in other animals.

MR. HARCOURT.

The great Creator has impressed certain propensities

propensities so strongly on different animals, that they are irresistible; and this powerful inclination stands them instead of reason, which is given to man as a being of superior order, to guide his judgment, and direct his conduct through the various scenes of life,

CHARLES.

What inducement can these fish have for thus changing the place of their habitation?

MR. HARCOURT.

Fresh water seems to be more suitable than the sea, for depositing their eggs and rearing their young. It is said that the females work beds in the sandy shallows of rivers, and there lay their eggs, which the male impregnates; afterwards they both are employed in covering the eggs with sand, each partaking in the labour necessary for bringing the eggs to perfection; these, in time, become vivified, and take their course to the sea, being then about four inches long. After a stay of six weeks, or two months, they return up the rivers; the salt water having caused them to

attain to nearly half their full growth, in that short space of time.

MRS. HARCOURT.

Salmon, and perhaps many other kinds of fish, seem absolved, by the laws of nature, from the sedulous attention in rearing their young, that is requisite in birds and terrestrial animals: their chief care is to provide for the preservation of the eggs, by depositing them in a suitable place; and after they have performed that office, they appear to have no further thought about them. Strangers to the pleasing solicitude of parental fondness, they may, with propriety, be ranked in an inferior scale of existence to the beautiful feathered race, whose tenderness and patient care may serve as models to careless mothers, who neglect their offspring, from indolence, or a love of other pursuits.

MR. HARCOURT.

When I was at Ballyshannon, I passed several hours in watching the fish leap up the cascade; and it is hardly credible, but to those who have been eye witnesses, that they should
be

be able to dart themselves nearly fourteen feet perpendicularly out of the water ; and, allowing for the curvature, they leap at least twenty. They do not always succeed at the first leap ; sometimes they bound almost to the summit, but the falling water dashes them down again ; at other times they dart head-foremost, or side-long, upon a rock, remain stunned for a few minutes, and then struggle into the water again : when they are so successful as to reach the top, they swim out of sight in a moment. They do not bound from the surface of the water, and it cannot be known from what depth they take their leap ; it is probably performed by a forcible spring, with their tails bent ; for the chief strength of most fish lies in the tail. They have often been shot, or caught with strong barbed hooks fixed to a pole, during their flight, as it may be termed ; and instances have been known of women catching them in their aprons. At high water the fall is hardly three feet, and then the fish swim up that easy acclivity without leaping. Sometimes I have seen, at low

water, fifty or sixty of these leaps in an hour, and at other times only two or three. I placed myself on a rock on the brink of the cascade, so that I had the pleasure of seeing the surprising efforts of these beautiful fish close to me; and at the bottom of the fall, porpoises and seals tumbling and playing among the waves; and sometimes a seal carries off a salmon under his fins.

AUGUSTA.

I knew a boy, of nine years old, who lived in Scotland, where the rivers are remarkably clear: he saw a salmon sporting in the water at the bottom of his father's garden, and jumped in. The fish was large and strong, and struggled to escape from his hold; but after a pretty smart contest, the boy came off victorious, and brought his antagonist safe to land.

HENRY.

That must have been fine sport; I should like to have been of the party.

CHARLES.

This account is very entertaining; but
I want

I want to know their method of taking these fish.

MR. HARCOURT.

They are caught in wiers, which are formed by damming up the river, except a space of of three or four feet in the middle, which the salmon having passed, are caught in a small enclosure, formed by stakes of wood ; the entrance is wide, and gradually lessens, so as barely to admit a single salmon at a time. Every morning, during the fishery, they are taken out by means of a staff, with a strong barbed iron hook, which is struck into them. But at Ballyshannon, by far the greater number is caught in nets below the fall: they sometimes catch near one hundred at a throw. The time of the fishery is limited ; and after it is elapsed, the enclosure is removed, the nets are laid aside, and the fish are at liberty to stock the rivers with spawn. The chief salmon fisheries, besides those in Ireland, are at Berwick on the Tweed, and along the coasts of Scotland. Vast quantities are salted,

or pickled, and put up in kegs, and sent to different parts of the kingdom.

MRS. HARCOURT.

There are also great quantities of salmon brought fresh to the London markets, by being packed in ice, which, by excluding the air, is found a preservative to many other things. The inhabitants of the northern parts of Europe, the Russians especially, preserve their fowls and other provisions, during their hard winters, when meat is difficult to be procured, in snow and ice.

MR. HARCOURT.

It would be tedious and unnecessary to particularize the various kinds of fisheries that are in different parts of the world. Oysters, lobsters, pilchards, anchovies, and sturgeon, are all caught in great quantities; the three latter, pickled or salted down for use. *Cavcar*, or *kavia*, a sauce much prized by the Italians, is made of the roe or eggs of the sturgeon. All these form extensive branches of commerce, and supply vast numbers of people with food, who reside at a great distance from the places

at which they are caught ; at the same time that they are a means of maintaining thousands of families, by furnishing useful and profitable occupation to them : nor must we omit to mention the great variety and vast numbers of fish, that are eaten without being salted, which daily supply our markets, and provide us with an agreeable change of diet. The produce of the ocean is inexhaustible : nor is it confined to fish alone ; the bottom is covered with vegetation in many parts.

AUGUSTA.

How is it possible to know that ?

MR. HARCOURT.

The sea throws up a great variety of sea weeds. Divers also relate that this is the case.

CHARLES.

Can men dive to the bottom of the sea ?

MR. HARCOURT.

There are people who are very expert in diving ; but a full account of this curious art is better deferred till another evening, as we have not time to enter into the particulars.

SOPHIA.

SOPHIA.

I have heard that the Giant's Causeway, in Ireland, is a great natural curiosity ; had you an opportunity of seeing it when you were in that country ?

MR. HARCOURT.

It was an object to which I paid particular attention. It is situated at the northern extremity of the island. It consists of about thirty thousand natural pillars, mostly in a perpendicular situation. At low water the causeway is about six hundred feet long, and probably runs far into the sea, as something similar is observed on the opposite coast of Scotland. It is not known whether the pillars are continued under ground, like a quarry. They are of different dimensions, being from fifteen to twenty-six inches in diameter, and from fifteen to thirty-six feet in height : their figure is generally pentagonal or hexagonal. Several have been found with seven, and a few with three, four, and eight sides, of irregular sizes. Every pillar consists, as it were, of joints or pieces, which are not united by flat surfaces ;
for,

for, on being forced off, one of them is concave in the middle, and the other convex : many of these joints lie loose upon the strand. The stone is a kind of besalts, of a close grit, and of a dusky line ; it is very heavy, each joint generally weighing two hundred and a half. It clinks like iron, melts in a forge, breaks sharp, and by reason of its extreme hardness, blunts the edges of tools, and by that means is rendered incapable of being used in building. The pillars stand very close to each other, and though the number of their sides differs, yet their contextures are so nicely adapted as to leave no vacuity between them ; and every pillar retains its own thickness, angles, and sides, from top to bottom. These kinds of columns are continued, with interruptions, for nearly two miles along the shore. By its magnitude and unusual appearance, it forms altogether an object of great rarity, and is mostly visited by all strangers who have any curiosity.

MRS. HARCOURT.

This is a wonderful account. It seems to be

be one of those productions of nature that may be termed a *unique*. I know of nothing similar to it. I met with a passage, last night, in Collinson's History of Somerset, though not immediately referring to the subject before us, that I cannot resist the pleasure of repeating. It is concerning a peculiar property of the limpet, (a species of shell-fish,) that is found at Minthead, in that county, which contains a liquor curious for marking linen. When the shell is picked off, there will appear a white vein, lying transversely in a little furrow next the head of the fish, which may be taken out with a bodkin, or any other pointed instrument. The letters or figures made with this liquor will presently appear of a light green colour, and, if placed in the sun, will change into the following colours: if in winter, about noon; if in summer, an hour or two after sun-rising, and so much before setting; for in the heat of the day in summer it will come on so fast, that the succession of each colour will scarcely be distinguished. Next to the first light green, it will appear of
a deep

a deep green, and in a few minutes change to a full sea green; after which, in a few minutes more, it will alter to a blue, then to a purplish red: after which, lying an hour or two, (if the sun shine,) it will be of a deep purple red, beyond which the sun does no more. But this last beautiful colour, after washing in scalding water and soap, will, on being laid out to dry, be of a fair bright crimson, which will abide all future washing. This species of limpets are, some red, others white, black, yellow, brown, and sand colour; and some are striped with white and brown parallel lines.

SOPHIA.

I should like to have a specimen of this marking liquor. It must be the most elegant of all methods of imprinting letters, &c. on linen.

MRS. HARCOURT.

I believe I have trespassed on your father's time by this account, but I was much pleased with it. Cecilia, close this conver-

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sation, by reciting Mr. Kcate's Address to the Ocean.

ADDRESS TO THE OCEAN.

CECILIA.

“Hail! thou inexhaustible source of wonder and contemplation! Hail! thou multitudinous ocean! whose waves chase one another down like the generations of men, and after a momentary space, are immerged for ever in oblivion! Thy fluctuating waters wash the varied shores of the world, and while they disjoin nations, whom a nearer connexion would involve in eternal war, they circulate their arts and their labours, and give health and plenty to mankind. How glorious! how awful are the scenes thou displayest! whether we view thee when every wind is hushed; when the morning sun silvers the level line of the horizon; or when the evening track is marked with flaming gold, and thy unrippled bosom reflects the radiance of the over-arching heavens! Or whether we behold thee in thy
terrors!

terrors! when the black tempest sweeps thy swelling billows, and the boiling surge mixes with the clouds! when death rides the storm, and humanity drops a fruitless tear for the toiling mariner, whose heart is sinking with dismay! And yet, mighty Deep! 'tis thy surface alone we view. Who can penetrate the secrets of thy wide domain! What eye can visit thy immense rocks and caverns, that teem with life and vegetation? or search out the myriads of objects, whose beauties lie scattered over thy dreary abyss? The mind staggers with the immensity of her own conceptions; and when she contemplates the flux and reflux of thy tides, which, from the beginning of the world, were never known to err, how does she shrink at the idea of that Divine Power, which originally laid thy foundations so sure; and whose omnipotent voice hath fixed the limits, where thy proud waves shall be stayed.!"

CONVERSATION V.

HENRY.

I HAVE been thinking, dear papa, that if there were as many whales as herrings, the sea would be hardly large enough to hold them.

MR. HARCOURT.

Providence has wisely limited the fruitfulness of the larger animals, both on land and in the sea, to a small number: whales, lions, and eagles, seldom bring forth more than two at a time. We may also observe with thankfulness, that the increase of noxious animals is generally restrained by the same wise law of nature; whilst those creatures which are useful to man multiply very fast. Did the birds and beasts of prey, and huge serpents, increase as fast as domestic animals, this globe would be no longer habitable; we should be forced to resign our places to them, and they would become lords of the creation.

MRS.

MRS. HARCOURT.

Your observation ought to excite in us a lively gratitude for the wise arrangement and proportion of creatures in the universe; a striking proof of the wisdom and goodness that governs all things. I have been frequently astonished at the accounts I have read of the increase of fish. There have been found in one cod-fish, 3,686,760 eggs; now, supposing only a half, or even a quarter of these eggs, to come to perfection, the increase is prodigious. Other kinds of fish multiply also in a surprising degree; yet there is no reason to think that any one kind increases beyond its due proportion with the rest. According to what we remark among the animals, that we have an opportunity of observing, each has its enemy; and it is reasonable to suppose that the same law prevails in the sea; and that each kind has a powerful adversary, that diminishes its numbers and keeps them within due limits.

SOPHIA.

Who could have the patience and per-
severance

severance to count such a vast number of small eggs?

MRS. HARCOURT.

Many naturalists have taken great pains to investigate this curious subject: but Mr. Harmer has pursued it with more success than any of them, by an ingenious method of first weighing the whole spawn very exactly: he then separated a certain number of grains, and carefully counted the number of eggs they contained, by which number he multiplied the remaining grains: thus, by the advantage of method and regularity, he obtained the knowledge of a curious fact in nature, easily, in comparison of the trouble he must have taken to have ascertained it by the tedious method of counting the whole.

CECILIA.

Now I am convinced of what you have often told me, that nothing can be well done without order and method. I will endeavour to be more attentive to this point, and do every thing with greater regularity for the future.

MRS.

MRS. HARCOURT.

Order is, indeed, the best guide in every kind of business, and distinguishes a well-taught mind from one that is uninstructed. It should extend to all our concerns: the disposal of our time and money, the proportion of amusement and business, should be regulated by some rule, and not left to the direction of mere chance, as is too often the case with many thoughtless people.

CHARLES.

What a prodigious quantity of salt must be consumed in the curing such multitudes of fish! I am ashamed to confess that I am ignorant whether salt be a natural or an artificial substance.

MR. HARCOURT.

I will give you some account of the manner of its production. You could hardly have chosen a more entertaining subject for our evening's conversation. Common salt, used for seasoning and preserving meat, fish, &c. is one of the most useful necessaries of life; and is of three kinds, viz. fossile or rock salt;

salt; sea or marine salt; and spring salt. Fossile or rock salt is found in large beds, or strata, within the bowels of the earth, sometimes crystallized, but more frequently in irregular masses of red, yellow, or blue colour.

HENRY.

Coloured salt! I have never seen any of that kind: why do we not use it?

MR. HARCOURT.

All salt becomes white by grinding. There are mines of rock salt in various parts of the world: they are found in Poland, Hungary, Germany, Italy, Spain, and England; as well as in some other countries in Europe. I shall confine myself to describing the manner of procuring this kind of salt, before I say any thing of the other sorts. The account of the Polish mines, in the village of Wiliska, five leagues from Cracow, the capital of Poland, which were discovered in the year 1251, will furnish us with an idea of them, that will serve for a description of salt mines in general. Their depth and capacity is surprising. Within them exists a kind of subterraneous republic,

or

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or commonwealth, which has its policy, laws, families, &c. ; nay, even public roads, for horses and carriages are kept here, for the purpose of drawing the salt to the mouth of the quarry, where it is taken up by engines. These horses, when they are once down, never see the light again ; but the men take frequent occasions of breathing the fresh air. What astonishment must a traveller feel, on arriving at the bottom of this wonderful abyss, where so many people are interred alive, and numbers of them even born there, that have never seen day-light. The first thing that strikes him with surprise, is a long series of vaults, sustained by huge pillars, cut with a chisel out of the rock salt, resembling so many crystals, or precious stones of various colours, reflecting a lustre from the light of the flambeaux, which are continually burning, that dazzles the eye with its splendour : nor can he be less surprised at observing a clear rivulet of fresh water running through the midst of these mountains of salt, and supplying the inhabitants with a source of comfort and accommodation,

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commodation, little to be expected in such a dreary region. The workmen he will find employed in hewing the rocks of salt, in form of huge cylinders, using hammers, pick-axes, and chisels, much as in our stone quarries, in order to separate the several banks. As soon as the massive pieces are got out of the quarry, they break them into fragments proper to be thrown into the mill, where they are ground, and reduced into a coarse powder, which serves the purposes of sea-salt.

CHARLES.

I remember going once with you into a stone quarry, and can therefore easily form an idea of it; but I am surprised to hear that salt is so hard as to require hammers and pick-axes to separate it.

MR. HARCOURT.

In its natural state, the masses of rock-salt are very hard. There are two kinds of sal gemma found in the salt mines of Wiliska; the one harder, and more transparent, and the crystallization of which appears more perfect than that of the other; this is the sal
gemma

gemina of the druggists and dyers. It cuts like crystal, and is frequently used for toys, chaplets, little vases, &c. I think I must procure you some specimens of them, Sophia; they will deserve a place in your cabinet of natural curiosities.

SOPHIA.

I should value them very highly, both as your gift, and as a great curiosity.

MR. HARCOURT.

The other kind is less compact, and suitable only for kitchen uses. The colour of the salt, while in the mass, is a little brownish; and yet, when ground, it becomes as white as if it had been refined. Some of these masses are found as hard and transparent as crystal; some white, yellow, blue, and fit for various works of taste, in which they engrave as on precious stones. The mine is cold and moist, which causes some difficulty in reducing the salt into powder. They make a blackish salt, of the water drawn out of it, which serves to fatten cattle. The salt mines of Catalonia are found in the mountains of the Duchy of Cordona:

Cordona: they form a solid mountain of rock-salt, between four and five hundred feet in height, and a league in circumference, and descending to an unknown depth below the surface. This prodigious mountain of salt, which has no mixture of other matter with it, is esteemed a great natural curiosity, and has raised a doubt among naturalists, whether salt does not grow. To give you an imperfect idea of the quantities of salt produced annually, it is said, that one of the Northwich pits, which is in Cheshire, has yielded, at a medium, four thousand tons of salt in a year. This salt is esteemed unfit for domestic uses, in its natural state, and therefore they use the method practised in Poland, Hungary, and many other places, on the coarser rock salt; they refine it, by dissolving it in weak brine, and then boiling it into salt again. The works, where the rock salt is refined, are called *Refineries*. The rock salt is broken small, and put into leaden cisterns, where it is dissolved in cold sea-water: when the solution has stood a day and night to settle, it is drawn
off

off from the sediment into the salt pan, and refined into salt in the same manner that common salt is boiled up. The scratch, or calcareous matter falling from it, forms a crust on the sides of the cistern. They are careful not to waste the brine left in the pans after the salt is taken out, but add it to the next quantity put into the pan, and so on to the end of the works. I cannot dismiss the subject of rock-salt, without mentioning the island of Toongming, in the East Indies, which affords the most remarkable kind of fossile or native dry salt, in the world. The country is, in general, very fruitful; but in certain parts of the island there are spots of ground, of several acres, which appear wholly barren, yielding not the least appearance of any thing vegetable on them. These spots of ground taste very salt, and abound with salt in such a manner, as not only to supply the whole island, but a great part of the neighbouring continent.

AUGUSTA.

Have the people of this country no other

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mark to find out the places that produce the salt, than the barrenness of the spot.

MR. HARCOURT.

When the inhabitants perceive the ground become dry, and covered with white spangles, which are pieces of salt, they are fully assured that this is a proper place to dig for that commodity. It is very remarkable, that the same pieces of land which produce vegetables one year, will produce this salt another: and on the contrary, the salt parts will, some seasons, be covered with vegetation. The salt work in this island is of great advantage to the inhabitants, and supplies all the poor, during the season, with employment. The men are occupied in collecting the salt and wetting the earth, and the women in boiling up the water, which they attend as carefully as the men. The second kind of salt is marine or sea salt, which is made from sea-water, thickened by repeated evaporation, and at length crystallized.

HENRY.

I do not understand what evaporation means.

MR.

MR. HARCOURT.

Heat, whether caused by the sun or fire, makes the watery particles of sea-water fly off, or disperse into the air, and leave the saline parts at the bottom of the vessel, which is called evaporation. The salt, thus deprived of the water, crystallizes, or hardens, and shoots into crystals, such as I showed you the other day in the microscope. Opake stones, pyrites, and minerals, when regularly formed, are said to be crystallized; as well as transparent stones and salts. Ice will give you the idea of a complete crystallization, composed of long needle-like masses, flattened on one side, and joined together in such a manner, that the smaller are inserted into the sides of the greater. The crystals of different kinds of salt afford great variety and beauty of forms, and are curious objects of microscopic observation. The regularity of their figure, each different substance producing a form appropriate to itself, is a confirmation, that not only the more obvious works of nature, but also the internal structure of or-

Podolian Desert, near the river Borysthènes; on the Russian frontiers, towards Crim Tartary; in the kingdom of Algiers; and in other countries. Where nature does not supply these lakes or ponds, artificial ones may be made. This is usually done very advantageously in France, where the chief coasts for bay-salt are those of Bretagne, Saintonge, and the Pay d'Aunis. In order to make a saline, or salt-marsh, a low plot of ground must be chosen, adjoining to the sea, and distant from the mouths of large rivers; and to render it complete, it should be near some convenient harbour for vessels. The ground thus chosen, must be hollowed out to three ponds or receptacles. The first, into which the sea-water is admitted, may be called the reservoir; the second receptacle, which is to be again divided into three distinct ponds, communicating with each other by narrow passages, and containing brine of different degrees of strength, may be called the brine-ponds; and the third receptacle, is to be furnished with an entrance, between which and the
brine-

brine-ponds, there is to run a long, narrow, winding channel; the rest of it is to be divided into small pits, containing a very strongly saturated brine, which is to be converted into salt, and they may therefore properly be called the salt-pits. The first receptacle must communicate with the sea, by a ditch, defended by walls; the ditch should have a flood-gate to admit, retain, or let out the seawater, as occasion may require. The bottoms of the reservoir, or brine-ponds, are to be lined with any kind of tough clay, or earth, that will hold water. The proper season for making salt in these artificial salinae, is from May to the end of August. When the saltmen open the flood-gate, at the time the tide is out, to drain off all the stagnating water, and after repairing and cleansing the receptacles from mud and dirt, they admit the seawater at the next high tide, till it floats the whole marsh, and stands at a proper height in the reservoir. In a few days most of the water in the salt-pits, is exhaled by the power of the sun, and what remains is a very
strong

strong brine. They daily supply themselves with more salt-water, in proportion to what is exhaled by the sun, and the workmen draw out the crystals of salt, as they are formed, every day, and dispose them in a pyramidal heap, which they cover over at the top with thatch or straw, to preserve it from the injuries of the weather. Thus, at a small expence and trouble, a salt is prepared, very fit for all domestic uses; and France, especially, is furnished with a very profitable article for exportation. The uses of common salt are various and extensive. Its acid and alkali are employed in many chemical operations in the arts. It is an important ingredient in the melting of glass, which it whitens and purifies. It facilitates the fusion of the metallic parts of minerals; and its peculiar use in preserving meat, &c. and giving a poignancy to the taste of various kinds of food, is universally known. Common salt is also useful as a manure, by fertilizing the soil.

CHARLES.

You surprise me! I remember to have rea

in history, of princes who commanded the lands of their enemies to be sowed with salt, that nothing might grow on them. The Bible furnishes me with an instance of it; when Abimelech destroyed the city of Shechem, he ordered the place where it had stood to be sowed with salt.

MR. HARCOURT.

It pleases me to observe, that you remember what you read, and that you apply it as occasions offer. Perhaps the error and prejudice of the ancients arose from their being ignorant that, though the salt is injurious and destructive to all vegetables, yet it increases the fertility and productive qualities of the earth.

MRS. HARCOURT.

That is a very curious distinction, that I was unacquainted with before. It grows late. Our lecture has been rather long this evening.

MR. HARCOURT.

It is time to separate; and as I have re-
lated

lated the most important particulars concerning salt, and the manner of preparing it, we will withdraw. Good night, children.

CONVERSATION VI.

AUGUSTA.

SOME gentlemen dined with us to-day, who came from Canada, in North America. I believe they took me for an ignorant girl, that might easily be made to believe any thing. I assure you they quite vexed me. They told me a number of improbable stories, of an animal that builds houses three stories high, makes bridges, and I know not what ridiculous stuff. I hate to be imposed upon; so I left the table as soon as the cloth was removed, and hastened here to tell you how I have been served.

MR.

Mental Improvements

MRS. HARCOURT.

Sophia, what is the name of this extraordinary animal, that has caused so much offence to Augusta?

SOPHIA.

I suppose it was the beaver, mamma.

AUGUSTA.

Ay, that is the very name; but I cannot believe these accounts to be true.

MRS. HARCOURT.

Sophia studies natural history: she shall tell us what she knows concerning this curious creature.

MR. HARCOURT.

Charles has been this morning to inspect a hat manufactory, and is therefore prepared to complete his sister's account of the beaver, by informing us what use is made of its fur. Sophia, it is your turn to begin.

SOPHIA.

Beaver or Castor makes a distinct genus of animals, of the order of *Glires*, and class of *Mammalia*. The characters are, that the upper fore teeth are truncated, and hollowed obliquely,

obliquely, and that the lower are oblique at the apex ; with a flat tail, and feet which have five toes on each, and palms adapted to swimming. Under this genus are comprehended three species. The Beaver or Fiber. Secondly, the Castor. Thirdly, the Castor, called *Fibethicus*.

MR. HARCOURT.

Very well defined, with the method and precision of a naturalist. Give us now a description of the animal, and afterwards its manner of living and habits.

SOPHIA.

The Beaver is about four feet in length, and twelve or fifteen inches broad ; his skin, in the northern regions, is generally black ; but it brightens into a reddish hue, in the temperate climates. He is covered with two sorts of hair, one long, and the other a soft down : the latter, which is an inch in length, is extremely fine and close, and furnishes the animal with a warm clothing ; the long hair preserves the down from dirt and wet. The head is like that of the otter, but longer ; the
snout

snout is pretty long; the eye small; the ears short, round, and hairy on the outside, but smooth within; and the teeth very long: the under teeth project the breadth of three fingers, and the upper, half a finger; all of which are broad, crooked, strong, and sharp. Besides those teeth which are called incisors, which grow double, are set very deep in their jaws, and bend like the edge of an axe, they have sixteen grinders, eight on each side, four above and four below, directly opposite to each other; with the former they are able to cut down trees of a considerable size; with the latter, to break the hardest substances. The legs are short, the fore-legs not exceeding four or five inches in length; the fore-paws are formed something like the human hand: these feet serve the beaver to dig, soften, and work the clay for different purposes; the hind feet are furnished with membranes, or large skins, extending between the toes, like those of ducks and other water-fowl. The tail is long, a little flat, entirely covered with scales, supplied with muscles, and per-

petually moistened with oil or fat, which the creature distributes all over them with his snout, and which he procures from four bags, which are placed under the intestines, and are found in every beaver, whether male or female: these bags are filled with a resinous liquid substance, which, when it is ejected, settles into a thick consistence. Physicians call it castoreum, and prescribe it as an excellent remedy against poisons, vapours, and other maladies; but when it grows old, it blackens, and degenerates into a dangerous poison.

MRS. HARCOURT.

. Before Sophia relates the manners and occupations of this creature, let us give particular attention to the implements with which nature has furnished it. The form and strength of the teeth are suited to cutting of wood and hard substances; and we have already been told that with these they are able to fell trees: the fore-paws are adapted to handling and disposing the materials of the work; the hind-feet are formed for swimming.

ming, and evidently show that the creature is intended to live in both elements, and is what is called an amphibious animal; the tail, from its flatness and the hardness of its scales, may serve very well for a hod, such as bricklayers use for carrying mortar, &c. And now, Augusta, do you think it totally improbable, that a creature furnished with such tools, and endued with a proportionable degree of sagacity to use them, should be able to construct houses of three stories, or build bridges, &c.

AUGUSTA.

Indeed I begin to be staggered; but is this really the case? Pray, Sophia, go on, for I am impatient to hear what you have to tell us further on this subject.

SOPHIA.

When they are going to chuse a place to build a habitation, they assemble in companies, sometimes of two or three hundred, and after mature deliberation, fix on a spot where plenty of provisions, and all necessaries, may be found. Their houses are always situated

in the water; and when they can find neither lake nor pond adjacent, they endeavour to supply the defect by stopping the current of some brook or small river, by means of a causeway or dam; for this purpose they set about felling of trees, which several of them together effect pretty easily, with their strong teeth: they take care to chuse out those that grow above the place where they intend to build, that they may swim down the current. They also, with wonderful sagacity, contrive that they shall fall towards the water, that they may have the less way to carry them. After the tree is felled, they cut it into proper lengths, and then roll them into the water, and navigate them towards the place where they are to be used. The causeway raised with these pieces of wood is sometimes ten or a dozen feet in thickness at the foundation; it descends on a slope on the side next the water. The opposite side is raised perpendicularly, like our walls; and the slope, which at its base is twelve feet broad, diminishes towards the top to the breadth of two feet. They

drive the extremities of these pieces of wood very near each other, into the earth, and interlace them with other stakes more slender and supple. But as the water, without some other prevention, would glide through the cavities, and leave the reservoir dry, they have recourse to a clay, which they perfectly well know how to procure, and which they work up into a kind of mortar with their tails, and close up the interstices with it, both within and without; and this entirely secures the water from passing away. If the violence of the water, or the footsteps of hunters who pass over their work, damage it, they immediately set about repairing it. They build their cabins, either on piles in the middle of the small lakes they have thus formed, on the bank of a river, or at the extremity of some point of land that advances into a lake. The figure of them is round or oval, divided into three partitions, raised one above another. The first is sunk below the level of the dike, and is generally full of water; the other two stories are built over it. The whole edifice is

mostly capable of containing eight or ten inhabitants. Each beaver has his peculiar cell assigned him, the floor of which he strews with leaves, or small branches of the pine-tree, so as to render it clean and comfortable. Their works, especially in the cold regions, are completed in August or September; after which they furnish themselves with a store of provisions. During the summer, they regale upon all the fruits and plants the country produces. In the winter they eat the wood of the ash, the plane, and other trees, which they steep in water, in quantities proportionable to their consumption; and they are supplied with a double stomach, to facilitate the digestion of such solid food, at two operations. They cut twigs, from three to six feet in length: the larger ones are conveyed by several beavers to the magazine, and the smaller by a single animal; but they take different ways. Each individual has his walk assigned him, to prevent the labourers from being interrupted in their respective occupations. These parcels of wood are not piled

piled up in one continued heap, but laid across one another, with interstices between them, that they may the more easily draw out what quantity they want; and they always take the parcel at the bottom. They cut this wood into small pieces, and convey it to their cell, where the whole family come to receive their share. Sometimes they wander in the woods, and regale their young with a fresh collation. The hunters, who know that these creatures love green wood better than old, place a parcel of the former above their lodge, and then have several devices to ensnare them. When the winter grows severe, they sometimes break the ice; and when the beavers come to the opening for air, they kill them with hatchets, or make a large opening in the ice, and cover it with a very strong net, and then overturn the lodge, upon which the beavers, thinking to escape in their usual way, by flying to the water and immersing at the hole in the ice, fall into the snare and are taken.

CECILIA.

Poor creatures! what can make any body so cruel as to ensnare and destroy such ingenious and industrious animals?

MR. HARCOURT.

Profit. The hunters in America catch vast numbers of them every year, for the sake of their skins and bags of castor, which they bring to the merchants, who send them to Europe.

CECILIA.

Pray what use do they make of their skins?

MR. HARCOURT.

I leave Charles to answer that question.

CHARLES.

Men's hats are made of the fur of the Beaver. Women are employed by the hatters, to clear the skins of the hair; for which purpose they use two knives: a large one, like a shoemaker's knife, for the long hair; and a smaller, not unlike a vine knife, to shave or scrape off the short hair or down. When the hair is off, they mix the stuff, putting
to

to one third of dry castor two thirds of old coat, (a term they use for the hair of those skins which have been worn some time by the savages, and by that means it becomes finer than the rest.) After it is mixed, they card it, which is pulling it smooth and even, between two things resembling a curry comb, with fine teeth; such as are used to card wool with before it is spun. They then take a proper quantity of this stuff for a hat, and put it upon the hurdle, which is a square table with chinks cut through it lengthwise: then the workman takes an instrument, called a bow, very like a fiddle-stick, and works the fur till it mixes well together, the dirt and filth passing through the chinks. In this manner they form two gores or pieces of an oval form, ending in a sharp corner at top. These pieces, or capades, as they are called, being formed in this manner, they proceed to harden them into closer and more consistent flakes, by pressing them with a hardening skin or leather; they are then carried to the bason, which is a sort of bench, with an iron
plate

plate fitted in it, and a little fire underneath it, upon which they lay one of the capades, sprinkled with water, and make use of a sort of mould to form it ; when, by means of the heat of the fire, the water, and pressing, the substance thickens into a slight hairy sort of felt or stuff. After they have turned up the edges all round the mould, they lay it by, and proceed in the same manner with the other half. The next thing is to join the two pieces together, so as to meet in a point at the top, and form a high-crowned cap. The hat, thus basoned, is removed to a large reservoir or trough, which is a kind of copper kettle, of a peculiar shape, filled with hot water and grounds ; after dipping the hat in the kettle, they begin to work it, by rolling and unrolling it again and again, first with their hands, and then with a little wooden roller, dipping it frequently in the kettle, till by fulling and thickening it in this manner, for four or five hours, it is brought into the size of the hat intended. They form the crown by laying the high-crowned cap on a wooden block of a
proper

proper size, and tying it round with a pack-thread, called a commander, which they gradually push down to the bottom of the block, with a piece of iron properly bent, which they call a stamper. When the hat is dried, they singe it, and rub it with pumice, to take off the coarser knap; it is afterwards rubbed with seal-skin, and lastly carded with a fine card.

MR. HARCOURT.

You have given us a very clear account of what you saw this morning; but pray tell us, whether something is not to be done to colour and stiffen the hat.

CHARLES.

O yes! the hat is sent upon the block to the dyer's, who makes a dye of log-wood, verdegrease, copperas, and alder-bark, and fills his copper with it, which is mostly large enough to hold ten or twelve dozen of hats at a time. He boils the hats in this dye for nearly an hour; then sets them out to cool, and boils them again ten or more times over, till the dye is complete: it is now returned to the ~~hatter~~
who

who dries it thoroughly over a charcoal fire, and then smears it with glue, or gum senegal, dissolved, to stiffen it. The next thing is to steam it on the steaming bason, which is a little hearth, or fire-plate, covered over with an iron plate that exactly fits it; on this plate wet cloths are spread, to prevent the hat from burning: the hat is placed brim downwards on it, and rubbed gently with the hand, till sufficiently steamed and dried; it is then put again upon the block, and brushed and ironed with flat irons, such as are used for ironing linen, which smoothens and polishes it; and nothing now remains to be done but to clip the edges, and sew a lining into the crown.

MRS. HARCOURT.

I thank you, in the name of the company, for the entertainment you have given us; and cannot help observing the wisdom of Providence, that has so wonderfully suited the formation and instincts of the beaver to its wants and appointed manner of life.

AUGUSTA.

I am all astonishment and wonder; and for
the

the future shall be more ready to listen to extraordinary things with attention; but I thought it foolish to give credit to any thing that seemed improbable.

MRS. HARCOURT.

There is a material difference between credulously asserting to every thing we hear, without examination, and listening attentively to the relations of people of sense and credit, who have no motive for imposing upon us; and who, if we have patience, will probably give good reasons for what they assert: but it is a mark of ignorance to believe every thing implicitly. Much depends upon the degree of credit due to the character of the person who relates the circumstance; but there are such wonders, both in nature and art, that, till they are explained, may well appear improbable to the uninformed mind. This reflection should incite us to pursue the attainment of useful knowledge, by attending to the conversation of people of experience and information.

MR. HARCOURT.

Conversation is an agreeable means of instruction: and those people who, by a habit of attention and observation collect knowledge wherever it is to be found, may meet with it from the most clownish rustic, or unlettered mechanic. Never despise any body, as too mean to learn from; but talk to every one in his own way, (that is, on the subject of his profession or calling,) and you may with certainty rely upon gaining information.

MRS. HARCOURT.

We have passed the time so pleasantly, that we have not been aware how late it is: it is time to take leave. Children, good night.

CONVERSATION VII.

MRS. HARCOURT.

BUSINESS prevents your father from his usual attendance; therefore we must find entertainment for ourselves: cannot we contrive some game or play to amuse us?

SOPHIA.

If you please, mamma, we will play at questions, in the manner Miss Groves showed us. You may propose a question, which each of us must try to answer in turn. Whoever gives a proper reply gains a prize.

CECILIA.

What shall the prize be?

CHARLES.

It need not be of any great value; some trifle, for the sake of the play.

MRS. HARCOURT.

I received a present yesterday, of some shells and fossile productions; it will give me

pleasure to distribute them among you : they will just suit the purpose. Sophia, you will find them in my cabinet : bring them, and dispose them in equal parcels.

SOPHIA.

What beautiful tints ! what colours can equal these ? Shells, flowers, and insects, are the finishings of nature ; and, for elegance of form, variety, and beauty of colour, as well as delicacy of texture, excel the finest works of art.

MRS. HARCOURT.

They will serve two purposes : the one as prizes for your answers ; the other as a subject for my first question. What is a shell ?

HENRY.

A shell is a house for a snail or a small fish to live in.

MRS. HARCOURT.

A prize belongs to Henry for his answer, as it is certain that shells furnish a case or covering, or, if you please, a habitation, for the insects that dwell in them : they also serve
them

them as a defence, or coat of mail, against their enemies, or any thing that might injure their tender bodies; but I mean to enquire in what manner the shell is produced.

CECILIA.

I suppose it is a part of the animal, formed with it, as bones are.

MRS. HARCOURT.

That was thought to be the case formerly; but the discoveries of M. Reaumur has shown the supposition to be false. He has proved that the shells of snails are formed from the perspiration of the animal, which is concreted or hardened by the air; and it is reasonable to suppose that the sea-water has the same effect on those of fishes. The casting of the shell of crabs and lobsters tends to confirm this opinion.

AUGUSTA.

Do they ever change their shells?

MRS. HARCOURT.

Yes, my dear, every year; the creature, aware of what it has to undergo, retreats to a place of security, such as the cavities of rocks,

or under great stones, where it lies till the parts are by degrees disengaged from the old shell. In this naked state they make a very disagreeable appearance, being a mere lump of flesh, covered with a sort of jelly, which by degrees hardens into a shell, somewhat larger than the old one, and thus accommodates itself to the growth of the animal.

CHARLES.

This is very wonderful indeed. Are shells a perfect defence to the fish that live in them?

MRS. HARCOURT.

I propose that as my next question, to be answered by the company.

SOPHIA.

I suppose there is no manner of doubt, as mamma has already told us, that they defend the fish against many injuries; but I read, a little while ago, that they are not a perfect security against all. Shell-fish are the food of some fish of the larger kinds, particularly the sea-porcupine, and a species of the wray fish feed chiefly upon them. These fish are provided by nature with a suitable apparatus for

for grinding them into a state proper for digestion, their jaws being furnished with bony substances, extending to the palate and under part of the mouth, which are capable of reducing strong shells into a pulp; but, what is most extraordinary, a small pectunculus or cockle, is the prey of the soal, which has no such instruments for breaking them to pieces, but is supposed to be furnished with the power of dissolving them; for, on examining the inside of a soal, many of these shells are found in part dissolved, while others remain unaltered.

MRS. HARCOURT.

How various are the powers of nature? She is not obliged to perform the same thing always by the same means, but uses variety of processes to produce the same effect. Into how many classes are shells divided by the best naturalists?

CHARLES.

A visit to the British Museum, in company with a friend of my papa's, who is a collector of shells, has rendered me capable of
resolving

resolving that question; they are generally divided into three classes: univalves, bivalves, and multivalves; which include sea, land, and fresh-water shells, which are subdivided into many genera and species. The first class consists of shells that are of one single piece, as a snail-shell; the second, of those which are formed of two, as the oyster or muscle; and the third, of those which have more pieces than two. Sea-eggs will furnish us with an example of these, being covered with spines or prickles. Land-shells are of two kinds, the recent and the fossile: the recent are those which are inhabited by living animals: but the fossile are the remains of marine bodies, supposed to have once inhabited the deep seas, though frequently found in great quantities under ground, in mines, and in places far distant from the ocean, and sometimes on the tops of mountains.

AUGUSTA.

Astonishing! by what strange accident could they ever come there?

CHARLES.

CHARLES.

That question has puzzled many wise and learned men. It is generally believed that those parts have, many ages ago, been covered with the sea; and some refer to the grand deluge as the cause of this wonderful change. They are very advantageous to the places where they are found, as they afford an excellent manure for land.

SOPHIA.

This is a convincing proof of the truth of the history of the deluge. The account that Moses gives us of the flood has always appeared to me so wonderful, that I could scarcely believe it; but I think, after this confirmation, I shall never doubt again concerning any thing, however extraordinary, that I find written in the Scriptures.

MRS. HARCOURT.

Remember, my dear, that the sacred writings contain a history of the miraculous interposition of Divine Providence, in teaching mankind the most holy and pure religion, from the earliest ages to the glorious dispensation of the Gospel. Can we then be sur-

prised, that they should contain things out of the course of nature? The very essence of a miracle is, that an effect is produced which can only be accounted for by the influence of a supernatural power. In the rude ages of gross ignorance, when the worship of idols was almost universal, some striking instances of a miraculous display of divine power was necessary, to convince men that a God existed, who had created all things, and who governed them with an all-seeing eye. The children of Israel were chosen as a peculiar people, among whom were displayed those extraordinary manifestations of the divine presence, that by their means the worship of the One True God might supplant the adoration paid to the sun, moon, stars, animals of various kind, and even to stocks and stones, by the different nations of the earth.—The multitude of fossile bodies found in places remote from the sea are an incontrovertible proof of some violent convulsion of nature, and perhaps are permitted to remain as a monument, to silence all cavillers on this subject.

subject. But let us resume the thread of our discourse. The vast variety of shells that are seen in the cabinets of collectors, are not all the produce of one sea or one country. Some of the most beautiful come from the East Indies and the Red Sea. The colours and brilliancy of shells seem to be improved and heightened by the heat of the sun, as those of warm climates always excel those found in cold countries in lustre. The shores of Asia furnish us with the pearl-oysters and scallops in great perfection. Shells of great beauty are also found on the shores of America, and the West Indies. In Africa, on the coast of Guinea, abounds a small species of porcelain shells, which the natives use as money.

AUGUSTA.

I thought nothing could serve the purpose of money but gold and silver.

MRS. HARCOURT.

Gold and silver are only used as a representation of real wealth. I give you a certain quantity of gold, in exchange for which you supply me with corn, cattle, or any of the necessities

necessaries of life. With the gold that you have received, you purchase some other commodity that you want from a third person, who likewise barter it in the same manner for something that he stands in need of: thus it passes from one to another, enabling them to exchange the commodities of life in a more exact proportion, with respect to the value of each, than could be done without such a medium. Shells, or any other durable substance, may answer the same purpose as gold, if men agree to receive it in the same way. The women in this country adorn their hair, and make bracelets and necklaces with another kind, which are perfectly white.

HENRY.

How droll they must look upon their black faces and necks.

SOPHIA.

We have different ideas of beauty, Henry. Perhaps they are as well satisfied with these simple ornaments, as our women of fashion are with diamonds and rouge. But we interrogate.

MRS.

MRS. HARCOURT.

The Mediterranean and Northern Ocean contain great variety of shells, and many of remarkable elegance and beauty; but upon the whole they are greatly inferior to those of the East Indies. Our own English coasts are not the last in the production of shells, though they cannot be compared to those of the East Indies for lustre and colour.

CECILIA.

I think I have heard that there is a method of polishing shells, mamma: will you be so kind as to tell us how it is done.

MRS. HARCOURT.

There are various methods of polishing shells, and adding to their natural beauty. Among the immense variety of shells with which we are acquainted, some are taken out of the sea, or found on its shores, in their utmost perfection, and cannot be improved by the hand of art, their beautiful tints being spread upon the surface, and the natural polish superior to any that could be given: but in others, the beauties are concealed by a coarse

outer coat, which the hand of a skilful polisher may remove. Collectors should have specimens of the same species, both rough and polished, that the naturalist may compare the natural state with the artificial one. How many fine strokes of nature's pencil, in this part of the creation, would be entirely concealed from our view, were it not for the assistance of an art that unveils and displays them in full lustre ! A shell that has a smooth surface, and a natural, dull polish, requires only to be rubbed with the hand, or a piece of chamoy leather, or some tripoli or fine rotten stone may be used, and it will become perfectly bright and polished ; but even this should be done with caution, for in many shells the lines are only on the surface, and the wearing ever so little of the shell defaces it. A shell that is rough, foul, and crusty, or covered with a tartareous coat, must be steeped for some hours in hot water, then it is to be rubbed with rough emery on a stick, in order to get off the coat : after this it may be dipped in diluted aqua-fortis, spirit of salt, or any other acid,

and after remaining a few moments in it, be again dipped in common water; then it is to be well rubbed with soap-suds: after which the operation may be finished with fine emery, and a hair-brush; and many, to heighten the polish, rub the shell with a thin solution of gum arabic, or the white of an egg. Gloves should be worn in using the aqua-fortis, as it is liable to injure the flesh wherever it touches. Some shells require more severe treatment, which is called scaling them, and is performed by a horizontal wheel of lead or tin, impregnated with rough emery, and the shell is worked down in the same manner as stones are by the lapidary: this requires the hand of a skilful artist, to avoid wearing away the shell too low, and spoiling it. After the shell is cut down as far as is proper, it is to be polished with fine emery, tripoli or rotten stone, with a wooden wheel, turned by the same machine as the leaden one: These are the principal means used in this art; and the changes that are produced by it are often so great, that the shell is not to be known for the same; for in-

stance, the onyx or volute is of a simple pale brown in its natural state, and becomes a fine bright yellow, with only just the outward coat taken off; but if eaten away deeper, appears of a white-milk, with a bluish hue towards the bottom. In the East-Indies they frequently engrave lines, circles, and other devices on many species of shells, particularly the nautilus; but this is a gross violation of good taste: so far from embellishing or heightening the charms of nature, it does not even imitate them.

CHARLES.

When we go to the sea-side, in autumn, we may collect shells, and polish them at our leisure hours. Among other curiosities that were pointed out to me at the British Museum, was a piece of byssus, which is a fine cloth, used by the ancients, when silk was rare, made of the threads of the pinna marina, a fish somewhat like a muscle, but much larger, and is held in its place in the same manner, by a prodigious number of very fine threads, which the animal has the power of spinning as

it finds occasion, as the spider and caterpillar do. These threads have in all times been used for the same purposes as silk. At present they are manufactured at Palermo, the chief city of Sicily, and other places, into gloves, stockings, and different sorts of wearing apparel. The method of rendering it fit for use is to lay it, for a few days, in a damp cellar to soften; then comb and cleanse it; and lastly, spin it in the same manner as they do silk. By these threads, the pinna-marina, or sea-wing, as it is sometimes called, suspends itself to the rock, twenty or thirty feet beneath the surface of the sea. In this situation it is so successfully attacked by the eight-footed polypus, that the species could not exist but for the assistance of the cancer pinnotheris, which lives in the same shell as a guard and companion. The pinnotheris, or pinnophylax, is a small crab, naked like Bernard's hermit, but is furnished with good eyes, and always inhabits the shell of the pinna. When they want food, the pinna opens its shell, and sends its faithful ally to forage; but if the

cancer sees the polypus, he returns suddenly to the arms of his blind hostess, who, by closing the shell, avoids the fury of her enemy ; otherwise, when it has procured a booty, it brings it to the opening of the shell, where it is admitted, and they divide the prey.

AUGUSTA.

This is curious indeed ; that one animal should supply eyes for another, in return for the advantages of a coat of mail.

MRS. HARCOURT.

It is almost time to distribute the prizes. Henry, that small lot of beautiful shells belongs to you. Charles will take these pieces of coral, and prepare himself by to-morrow evening to give us some account of the nature of coral, whether animal or vegetable ; and Sophia, this paper nautilus is reserved for you. I hope you are able to give us some particulars relative to the fish that inhabit it.

SOPHIA.

The general form of the nautilus is adapted to swimming on the water, and resembles the figure of a boat or vessel, but varies in some

particulars in the different species. The name is derived from a Greek word, signifying both a fish and a sailor. It is supposed that men first took the idea of sailing in vessels, from what they saw practised by this little creature. The paper nautilus is so named from the thinness of the shell, which it sometimes creeps out of, and goes on shore to feed. When this animal intends to sail, it extends two of its arms on high, and supports a membrane between them, which it throws out to serve as a sail, and its two other arms hang out of the shell, to be used occasionally as oars, or as a steerage ; but this last office is generally performed by the tail. When the sea is calm, numbers of these fish are frequently seen diverting themselves with sailing about in this manner ; but as soon as a storm arises, or any thing disturbs them, they draw in their arms, and take in as much water as makes them a little heavier than the sea-water in which they swim, and by that means sink to the bottom. When they desire to rise again, they expel this abundant water through

number of holes, which they have in their arms, and so lighten themselves.

MRS. HARCOURT.

The manners and instincts of those animals that inhabit the ocean, are greatly concealed from us by their situation ; but those few that have offered themselves to our observation, display instances of the same admirable wisdom that has formed the inhabitants of the earth and air. Should man ever be enabled, by any future discovery, to traverse the bottom of the sea, what wonders would be opened to his view ! what numberless examples of contrivance and sagacity, directed by the same wisdom that has instructed the bee to gather honey, and the beaver to construct his habitation, would appear ! The different contrivances that several species of fish, whose manners are known, discover, in the modes of catching their prey, are so wonderful and curious, that I cannot deny myself the pleasure of relating a few instances. The sturgeon is without teeth, and his mouth placed under the head, like the opening of a purse, which
he

he has the power of pushing suddenly out, or retracting. Before this mouth, under the beak or nose, hang four tendrils, some inches long, and which so resemble earth-worms, that at first sight they may be mistaken for them. This clumsy, toothless fish is supposed by this contrivance to keep himself in good condition, the solidity of his flesh evidently showing him to be a fish of prey. He is said to hide his large body amongst the weeds near the sea-coasts, or at the mouths of large rivers, only exposing his *irrhii* or tendrils, which small fish or sea-insects mistaking for real worms, approach for plunder, and are sucked into the jaws of their enemy. The flesh of the sturgeon was so valued in the time of the emperor Severus, that it was brought to table by servants with coronets on their heads, and preceded by music, which might give rise to its being in our country presented by the lord mayor to the king. At present it is caught in the Danube and the Wolga, the Don, and other large rivers, for various purposes. The
skin

skin makes the best covering for carriages; isinglass is prepared from parts of the skin; cavear from the spawn; and the flesh is pickled or salted, and sent all over Europe, as your father told you in his account of the fisheries. There is a sea insect, described by Mr. Huges, whose claws or tentacles being disposed in regular circles, and tinged with variety of bright, lively colours, represent the petals of some most elegantly-fringed and radiated flowers; as the carnation, marigold, and anemone: these beautiful rays serve them as a net for inclosing their prey. These entertaining subjects have insensibly led us on till it is late. Good night, children: let us retire.

CONVERSATION VIII.

MR. HARCOURT.

GOOD evening to you, ladies. I regretted losing the pleasure of joining your party last night, but understand from Mrs. Harcourt, that you were very well amused with the subject of shells and fossils.

CECILIA.

Nothing was wanting but your company, to render our evening delightful.

MRS. HARCOURT.

Delightful! my dear Cecilia; that is too strong a word. Learn to moderate your expressions. Suit your terms to the occasion; or you will be at a loss to raise your language in proportion to your feelings, when important events excite your liveliest emotions.

CECILIA.

How often do I forget your precepts in this respect; although I endeavour to attend to them.

them ; but I did enjoy myself so very much last night, that I thought I might say delightful, without any exaggeration.

MRS. HARCOURT.

I am glad you were so well pleased ; but restrain the warmth of your expressions : an excess in this way may be ranked among the follies of the present fashionable manners : it is not only absurd in itself, but tends to give us false ideas of things, and induces us to consider that as important, which in its own nature is but trifling. Whenever I hear a girl exclaim, upon every trifling variation of weather, I am dying of heat ; I am frozen to death ; or melting in ecstasies at a concert or a play ; I suspect either that her imagination has been suffered to run wild, or that she has never been instructed to adapt her language to her ideas. Such excess of speech is to be expected from novel and romance readers, but are ill suited to a woman of good sense and propriety of manners.—Well, Charles, we expect our entertainment from you, to-night. Have you been enabled to discover whether
corals

corals and corallines are to be ranked in the vegetable or animal kingdom ?

CHARLES.

Linnaeus has classed them among the zoophytes, which are a kind of intermediate body, supposed to partake both of the nature of an animal and a vegetable, as the Greek word from which it is derived indicates, signifying plant-animal. In the Linnæan system, the zoophytes, which constitute the fifth order of worms, are composite animals, resembling flowers, and springing from a vegetating stem. This order contains fifteen genera, of which nine are fixed, and have no power of removing from the places where they are formed ; as the isis or red coral, sea-fan or gorgonia, alcyonium, sponge, flustra, tubularia, corallines, surtularia, and vorticella : but the others possess the faculty of transporting themselves from one place to another ; as the hydra or polype ; the pennatula or sea-pen ; tænia ; volvex ; furia ; and chaos, or the assemblage of chaotic or microscopical animals. The species under this order are one

hundred and fifty-six. The immense and dangerous rocks built by the swarms of coral insects in the Southern Ocean, which rise perpendicularly like walls, are described in Cook's Voyages. A point of one of these rocks broke off, and stuck in the hole that it had made in the bottom of one of his ships, which must otherwise have perished by the admission of water.

MR. HARCOURT.

Their prodigious multiplication in all ages of the world is shown by the numerous limestone rocks, which consist of a congeries or heap of the shells of these animals, which constitute a great part of the solid earth. Specimens of these rocks are to be seen in the lime-works at Linsell, near Newport in Shropshire; in Coalbrook Dale; and in several parts of the Peak of Derbyshire. It is remarkable that many of those found in a fossile state, differ from any species of the recent ones that are known, and have either been produced in the deep seas, where no human eye can penetrate, or are become extinct. I suppose, Charles,
you

you can inform us from what country the best coral comes, and in what manner it is procured.

SOPHIA.

The fishing season for coral is from April to July. The places are the Persian Gulf, Red Sea, coasts of Africa, towards the Bastion of France, the isles of Majorca and Corsica, and the coasts of Provence and Catalonia. Seven or eight men go in a boat: the oaster throws the net, which is formed of two beams tied across, with a leaden weight to press them down. A great quantity of hemp is loosely twisted round, among which they twist some strong nets, and fasten to the beams. Thus prepared, it is let down into the sea; and when the coral is pretty much entangled, they draw it out by a rope, which it sometimes requires half a dozen boats to effect. It is used as a medicine in various diseases.

SOPHIA.

I suppose it is but lately that the real nature of coral has been ascertained; was it not formerly reckoned a vegetable?

MR. HARCOURT.

It was formerly reckoned among the number of marine plants; but the discoveries of modern naturalists have raised it to the animal kingdom, since their observations satisfactorily prove that it is the structure and habitation of certain sea-animals, and designed for their protection and support. The nature and origin of coral have been as much disputed as any subject in natural knowledge. Some have considered coral, and other similar productions of the sea, as stone. They adopted this opinion from their excessive hardness, and specific gravity, as well as from observing that when these bodies were calcined, they were converted into lime. Kircher supposes that there are entire forests of it at the bottom of the sea, which is not at all improbable, since M. de Peysonnel has demonstrated, by his experiments, that it is constructed by an animal of the polype kind. In forming coral, and other marine productions of this class, the animal labours like those of the testaceous kind, each according to his species,

cies, and their productions vary according to their several forms, magnitudes, and colours. The coral insect, he observes, expands itself in water; and contracts itself in air, or when it is touched with the hand, or when acid liquors are poured upon it: and he actually saw these insects move their claws or legs, and expand themselves when the water in which they were was placed near the fire. Broken branches of coral have been observed to fasten to other branches. The coral insects, not having been injured, continue their operations; and as they draw no sustenance from the stone of the coral, they are able to increase in a detached state. M. de Peyssonnel observed that it grows in every direction: sometimes horizontally, sometimes perpendicularly downwards, at other times upwards. Coral then is a mass of animals of the polype kind, having the same relation to the polypes united to them, that there is between the shell of a snail and the snail itself. Pray, Charles, tell us how many kinds of coral there are?

CHARLES.

There are three kinds; red, white, and black : the black is the rarest, and most esteemed; but it is the red that is mostly used in medicine. There is no part of the world where white coral is produced in such abundance as on the shores of the island of Ceylon, and other of the neighbouring coasts. The lime made in those countries for building houses, fortifications, &c. is all prepared by burning this coral. It lies in vast banks, which are uncovered at low water; and it is spongy and porous. While young, it is formed erect, in shape of little shrubs, and is then firm and solid, with a smooth surface; but the branches continually shoot out, and from those new branches proceed others, till the whole is one confused bush, which is all covered with a white viscous matter, which in time hardens upon them, and becomes coral; and this filling up all the interstices, and hardening between them, renders it one coarse rock,

CECILIA.

CECILIA.

I observed you named sponge among the zoophytes: surely that cannot be the habitation of insects. I have often wondered what it is, but have never been able to satisfy my curiosity.

MR. HARCOURT.

Sponge is a kind of marine substance, found adhering to rocks, shells, &c. under cover of the sea-water. Naturalists have till lately been greatly embarrassed in which of the three kingdoms to place it; but it is now decidedly allowed to belong to some species of worm or polype. The same M. de Peyssonnel has discovered and described the worms that form four different species of sponges: he thinks the sponge is formed from the juice or slaver, which is deposited by the worms that inhabit them.

HENRY.

The next time I have any to rub my slate with, I will try if I can find any of these insects,

MRS.

MRS. HARCOURT.

It will be a vain endeavour. The insects are all dead, long before the sponge comes to our hands; besides, they are so small as to require the best microscopes to discover them.

AUGUSTA.

I know a lady that has a beautiful grotto in her garden, ornamented with a variety of corals and shells. I shall observe it with more attention the next time I visit her.

CHARLES.

I wonder any body should bestow the money and trouble necessary to form such a collection, to place them in a garden, where they are liable to be stolen, and are exposed to the injuries of the weather.

SOPHIA.

Perhaps the corals are artificial; and ordinary shells, mixed with pebbles, and pieces of coloured glass, the refuse of the glass-house, would have a very pretty effect.

CECILIA.

Artificial coral! I never heard of such a thing. Pray, sister, how do they make it?

SOPHIA.

SOPHIA.

After having chosen twigs and branches to your fancy, resembling the manner of the growth of coral as much as possible, you must peel and dry them. Then take one ounce of clear rosin, and dissolve it in a brass pan, to which add two drams of the finest vermilion; mix these ingredients well together, and paint the branches with it whilst it is warm; then hold them over a gentle coal fire, till they are smooth and even, as if polished. In the same manner, white coral may be imitated with white lead, and black coral with lampblack.

CHARLES.

If papa and mamma will give us leave, we will build one near the river, at the top of the grove. I will undertake to be the architect, and perform the rough work.

MRS. HARCOURT.

I approve the plan, and will assist in the execution of it.

MR. HARCOURT.

I agree to it, on one condition, that it shall not infringe upon the time of your studies.

Rise

Rise an hour earlier every morning; that will give you sufficient opportunity for the work.

CECILIA.

That will be no hardship these beautiful mornings: let us agree to meet at six o'clock.

AUGUSTA.

I am not used to rise till eight. How shall I ever contrive to be ready?

HENRY.

I will rouse you, by ringing the bell.

MRS. HARCOURT.

Late rising is a bad habit, that you have been allowed to contract; but, my dear Augusta, determine to overcome it. It will require a little resolution at first; but when you consider the advantages it will procure, I am persuaded the difficulty will appear trifling. Health and opportunity for improvement result from an early hour: a pale face, languor, and slothfulness, are the penalties of lying long in bed. A too great proportion of sleep is equally a species of intemperance with gluttony, and drunkenness; and yet many persons,

sons, who would shudder at being accused of those depravities, freely indulge themselves in the former, from want of consideration, ill example, and long habit; and by that means injure their constitutions, and lose a large portion of the active part of their lives. Perhaps the building of this grotto may be a fortunate means of accustoming you to wake at a proper hour; and when you once have used yourself to it, you will find it both pleasant and profitable.

AUGUSTA.

You have convinced me of the advantage of rising early; and I shall endeavour to be one of the first at the grove. Papa has lately given me a fine pearl necklace, that was mamma's. My governess tells me that they are not beads, but that they are found in oysters. I thought I would enquire, the next time we met, how they came there, as I suppose they are no part of the fish.

MR. HARCOURT.

Many have been the conjectures of both ancient and modern writers concerning the
production

production of pearls. Some have supposed them to proceed from a disease of the fish ; but there seems to be a great similarity between them and what is found in the crabs, called crabs-eyes, which are formed near the stomach of the animal, and serve as a reservoir for calcareous matter, against the forming of a new shell, at which time they are dissolved, and deposited for that purpose. As the internal part of the shell of the pearl-oyster, or muscle, consists of mother-pearl, which resembles the material of pearl, and as the animal has annually occasion to enlarge his shell, there is reason to suspect that the loose pearls are similar reservoirs of the pearly matter for that purpose. The fish, in which the pearls is found, is much larger than the common oyster, and is called *concha-margaritifera*. It abounds on the coast of Persia, near Ormus ; about Cape Comorin ; and on the coast of the island of Ceylon. The oriental pearls are most valued on account of their largeness, colour, and beauty ; but pearls are caught in the seas of the East-Indies, in those
of

of America, and in some parts of Europe. At the commencement of the season, which is in March and April, and again in August and September, there appear frequently two hundred and fifty barks on the banks: in the larger are two divers; in the smaller, one. Each bark puts off from shore before sun-rise, by a land-breeze which never fails, and returns again by a sea-breeze which succeeds it at noon. As soon as the barks have arrived at the place where the fish lie, and have cast anchor, each diver binds a stone under his body, which is to serve him as ballast, and prevent his being driven away by the motion of the water, and also to enable him to walk more steadily among the waves. Besides this, they tie another heavy stone to one foot, in order to sink them to the bottom of the sea: and as the oysters adhere strongly to the rocks, they arm their fingers with leather gloves, or take an iron rake to displace them with. Lastly, each diver carries with him a large net, tied to his neck by a long cord, the other end of which is fastened to the side of the

bark. The net or sack is intended to hold the oysters he may collect; and the cord is to pull him up by, when his bag is full, or when he wants air. Thus equipped, he precipitates himself, sometimes above sixty feet under water. As he has no time to lose, as soon as he arrives at the bottom, he begins to tear the oysters off the rocks and cram them into his budget. At whatever depth the divers are, the light is sufficient for them to see what passes around them; and sometimes, to their great consternation, they behold monstrous fishes, from whose jaws they can escape only by mudding the water, and concealing themselves by that means: but this artifice will not always save them from falling a prey to these formidable enemies. The best divers will remain under water nearly half an hour, during which time they hold their breath, without the use of oils, acquiring the habit by long practice; but the exertion is so violent, as generally to shorten the lives of those who repeat it frequently. Besides this method of diving, there is a way of descending in a diving bell,

bell, so contrived as to be replenished often with fresh air by means of air-barrels, which are let up and down by ropes.

SOPHIA.

The dangers that the poor divers incur, to obtain a mere bauble, (for I suppose pearls are only used for ornaments,) are far more dreadful than those of the Greenland fishermen.

MRS. HARCOURT.

The poor men, who encounter these dangers for a livelihood, do not consider how trifling the value of the pearls is in itself, but what great advantages they can gain by the risk. Single pearls have been sold for immense sums of money. Cleopatra, queen of Egypt, wore one as an ear-ring, that Pliny has estimated at eighty thousand pounds sterling. The real value of pearls and diamonds is small, because they do not contribute to the support or comfort of the life of man; but whilst people of fortune will lavish great sums upon such insignificant things, there will always be found people, whose necessities will impel them to obtain them at

the risk of their lives. It is time to separate! Remember our appointment in the grove a six to-morrow morning.

CONVERSATION IX.

MR. HARCOURT.

WELL, ladies, how have you proceeded with your grotto? Though I am not one of the party, I am interested in your success.

SOPHIA.

We go on very well indeed; Charles has drawn the plan, and mamma has given James leave to help my brother to dig the foundations: Augusta and Cecilia are employed in sorting and cleaning the shells and fossils; they also have undertaken to collect pebbles, and gather mosses, attended by little Henry, who carries a basket to put them in; and I am very busy in making artificial coral. Thus we all take a share. Mamma is so kind as to promise us
a present

a present of shells and ores ; and, if you please, you must contribute, by procuring us some glass cinders, or refuse of the furnaces of the glass-house.

MR. HARCOURT.

Most willingly shall I supply you with that, or any other thing you may want, to forward your design ; but pray, can any of you inform me what are the ingredients that compose glass ?

CHARLES.

I think, Sir, you have told me, that the principal articles in its composition are salt and sand, or some kind of stone which answers the same purpose. The salt must be of the fixed kind, such as will not evaporate with the most intense heat, and is generally procured from the ashes of a vegetable called kali, which is brought from the Levant. The sand, or stone, must be such as will melt easily, which gives firmness and consistence to the glass.

MR. HARCOURT.

The best stone for this purpose comes also from Italy, and is called *tarso*. But sand is

now almost the only substance employed in the British manufactures of glass. The most suitable is that which is white, small, and shining. When examined by the microscope it appears to be fragments of rock crystal. That which is of a soft texture, and more gritty, does very well for green glass. Our glass-houses are furnished with white sand for their crystal glasses, from Lynn in Norfolk, and Maidstone in Kent; and with the coarser, for green glass, from Woolwich. Other ingredients are occasionally mixed with these, according to the kind of glass required; such as arsenic, manganese, lead, &c.

MRS. HARCOURT.

Sophia, you have seen a glass-house, can you give some account of the operations performed there?

SOPHIA.

There are three sorts of furnaces used in the glass-works. After having properly mixed the ashes and sand together, they are put into the first furnace, where they are burned or calcined for a sufficient time, and become

what is called frit, which being boiled in pots or crucibles of pipe-maker's clay, in the second furnace, is rendered fit for blowing.

AUGUSTIA.

How very extraordinary, that materials of so gross and dirty a nature, should ever become so beautiful and transparent as glass! What occasions so great a change?

MRS. HARCOURT.

The metamorphosis, (for it may well be termed so,) is caused by the action of the fire, which, when intense, vitrifies, or turns them into glass. Sophia, go on with your account.

SOPHIA.

The workman, who blows the glass, takes his blowing iron, which is a hollow tube about two feet and a half long, and dipping it in the melting-pot, turns it about. The metal sticks to the iron like honey. He dips four times for every glass, and at every dip, rolls the end of his instrument, with the glass on it, on a piece of iron, over which is a vessel of water, which by its coolness consolidates the glass, and dresses it to bind better with the

next to be taken out of the pot. When he has got enough on the iustrument, he begins to blow gently through it, in the same manner as boys blow soap-suds through a pipe; and in order to give it a polish, he rolls it backwards and forwards on a stone or marble: after blowing, and whirling the iron till he has formed the glass to the intended shape, he delivers it to the master workman to break off the collet, which is a little piece that sticks to the iron. In order to hollow it out, another workman thrusts in an iron instrument, and turns it round with a circular motion, till it is sufficiently enlarged. When it is perfectly formed, it is set in the lear or third furnace, to anneal or harden. It is proper to add, that the stem and the foot of a drinking glass, require each a distinct operation.

MRS. HARCOURT.

Habit and long practice enable these men to endure these scorching heats, which they receive directly in their faces, mouths, and lungs. They are always obliged to work in their shirts, with a broad-brimmed straw

hat on their heads, to preserve their eyes from the excessive heat and light. They sit in large, wide, wooden chairs, with long elbows, to which their instruments are hung. They work for six hours without intermission, when they are relieved by another set of workmen, who take their places for the same space of time.

CECILIA.

Panes of glass for windows cannot surely be formed by blowing; pray how are they made?

MR. HARCOURT.

The workman contrives to blow and dispose his glass so as to form a cylinder, which by frequently heating and working on a kind of earthen table, at length begins to open and unfold like a sheet of paper, a previous notch or incision being made for that purpose in the cylinder of glass; and thus it becomes flat: the table of glass is now nearly perfected, and requires nothing further but to be heated over again. When taken out, they lay it on a
table

table of copper, from whence it is carried to the third furnace to anneal.

HENRY.

Pray explain the meaning of that word: I do not understand it.

MR. HARCOURT.

It signifies to bake or harden. The first furnace in a glass-house is heated to an intense degree of heat, in order to fuse or incorporate the ingredients; the second is also heated sufficiently to melt and vitrify the frit into a glassy substance; but the third is moderately heated, that it may perform the office of baking or hardening the work, when fashioned to the shape it is to bear.

HENRY.

You have explained this so clearly, that I am no longer at a loss to comprehend it.

MR. HARCOURT.

There are two methods of making plates for looking-glasses; the one, by blowing them much in the same manner as they blow glass for windows, but on a larger scale: the other, casting or running of them, which is generally practised

practised in making large glasses. The French claim the honour of this invention. It was first proposed to the French court in 1688, by the *Sieur Abraham Thevatt*. It is performed in nearly a similar manner to the casting of sheet-lead; and this method not only enables them to make glasses of more than double the size of any made by blowing, but also to cast all kinds of borders, mouldings, &c. The furnaces for melting the materials of this manufacture are of an enormous size; and those for annealing the glasses, when formed, still larger. There are at least twenty-four annealing furnaces or ovens, each above twenty feet long, placed around a melting furnace. All these furnaces are covered over with a large shed, under which are likewise built forges and workhouses for smiths, carpenters, and other artificers, who are continually employed in repairing and keeping in order the machines, furnaces, &c. as also apartments for these and the workmen employed about the glass, so that the glass-house in the castle of *St. Gobin*, in the forest
of

of Ferc, in the Soissonois, celebrated for its excellence in this manufacture, appears more like a little city, than an assemblage of workmen's sheds. The insides of the furnaces are lined with a sort of baked earth, adapted to sustain the action of fire; and the same earth serves also for melting-pots, cisterns, &c. The cisterns are about a yard long, and half as wide; they serve for the conveyance of liquid glass, which is drawn out of the melting-pots, to the casting tables. When the matter is sufficiently vitrified, refined, and settled, they fill the cisterns, and leave them in the furnace, till they appear white through excessive heat. The table on which the glass is to be run, is of cast iron. There is a curious machinery to remove the cisterns from the furnaces to the table, which places them in an inclined position, so as to discharge a torrent of matter, like liquid fire, with which the table is presently covered. As soon as the glass is come to a consistence, they shove it off into the annealing furnace, with an iron roller as wide as the table, being assisted by workmen

workmen on the other side of the furnace, who pull it to them with iron hoops.

CHARLES.

I cannot imagine how they contrive to remove them in that burning state, without either breaking the glasses or hurting themselves.

MR. HARCOURT.

The surprising dexterity and quickness with which they perform the different operations, is inconceivable to those who have not been eye-witnesses of that wonderful manufacture. The tisors, or persons employed in heating the large furnaces, run round the furnace in their shirts, without the least intermission, with a speed scarcely inferior to that of the lightest courier ; as they go along, they take two billets of wood, and throw them into the first furnace ; and, continuing their course, do the same for the second. This they hold on uninterruptedly for six hours together. One would not expect that two such small pieces of wood, which are consumed in an instant, would maintain the furnace in the proper de-

gree of heat, which is so great, that a large bar of iron, laid at one of the mouths of the furnace, becomes red hot in less than half a minute. The process of these glasses is now completed, except grinding, polishing, and foliating, or laying on of the quicksilver. The grinding of glass requires great nicety, when performed on glasses that are designed for telescopes, or other optical uses. Plate or cast glass is ground by placing it on a stone table, in such a manner that it cannot be shaken or displaced, and then by means of a wooden frame, another glass is rubbed backwards and forwards over it, with water and sand between them; and thus, by constant attrition, their surfaces become smooth.

MRS. HARCOURT.

Various are the uses to which the ingenious invention of glass is applied, besides the different accommodations with which it supplies domestic wants; such as windows, looking-glasses, and all the innumerable variety of vessels that adorn our tables, and contribute to our convenience. Natural philosophy is
greatly

greatly assisted by telescopes, microscopes, magnifying glasses, &c. which enable us to view objects too minute, or too distant, ever to be examined by the naked eye. Many experiments in electricity, and on the properties of the air, the knowledge of which is called pneumatics, could not be performed without the assistance of glass. The eye-sight of aged persons, or those who have a defective sight, receive relief from spectacles, which they must have sought in vain without this invention. They were the fortunate discovery of a monk of Pisa, in the year 1299. Nor does it only serve for useful purposes: it also supplies us with various kinds of ornaments. Most of the precious stones are so well imitated by this composition, as to deceive the eye of those who are not critical judges.

CHARLES.

Among the variety you have enumerated, you have omitted burning glasses, which are so contrived, that they draw the sun's rays into one point or focus, and are capable of setting fire to any thing that will burn. Some

historians relate, that Archimedes, the celebrated mathematician of Syracuse, invented glasses of this kind, so powerful, that they set fire to the Roman ships, besieging Syracuse, under the command of Marcellus, and destroyed the whole fleet. Thus the ingenuity and invention of one man was able to resist and repel the united force of thousands, under the command of the most accomplished general of his age and country.

MR. HARCOURT.

Your historical anecdote is very suitably introduced, and is an eminent instance of the superiority of wisdom over brutal strength.

SOPHIA.

Has not the invention of the armonica some claim to be mentioned, before we dismiss this subject?

MRS. HARCOURT.

I am not surprised it should be recollected by a lover of music; but, Sophia, you should not raise curiosity without satisfying it: perhaps some of the company may not know what an armonica is.

SOPHIA.

SOPHIA.

The armonica is a musical instrument, remarkable for the sweetness of its notes, and consists of glasses, of the shape of a globe cut in half. The whole set is fixed upon a spindle, and then played upon by turning them round with a wet finger.

MR. HARCOURT.

This method of producing musical sounds, though first introduced among us by Mr. Puckeridge, of Ireland, has been long since practised in Germany: and the Persians have also a similar invention, by striking seven cups of porcelain, containing a certain quantity of water, with small sticks.

CECILIA.

Among the other curiosities made of glass, give me leave to mention Rupert's drops, which are formed somewhat in the shape of a pear, of green glass, and though they will bear the heaviest stroke of a hammer without breaking, fly to pieces in a moment, if you break off the tip of the tail.

HENRY.

before there was any glass? I can think of nothing that would keep out the cold, and be clear at the same time.

MRS. HARCOURT.

Horn and oiled paper were the substitutes they were obliged to use. Glass-windows were not known in England till 1180; and then were considered as a mark of great magnificence, suitable only to palaces, churches, &c. The Italians possessed this art first. The French learned it of them; and from thence it was brought into England. Venice, for many years, excelled all Europe in the fineness of its glasses; and, in the thirteenth century, were the only people that had the secret of making crystal looking-glasses. The glass manufacture was first begun in England in 1557. Glass plates were made at Lambeth, in 1673, under the patronage of the Duke of Buckingham, who introduced this manufacture into England with amazing success. So that in a century we have attained the art in a degree that rivals even the Venetians; and are no longer obliged to be supplied with this article from foreign countries.

AUGUSTA.

What beautiful painted windows I have sometimes observed in churches. There is one in Norwich cathedral, that is reckoned to be very finely painted, done by Mrs. Lloyd, who was the wife of one of the deans. Papa was acquainted with her; and he says she added many other elegant accomplishments to her skill in painting on glass.

MRS. HARCOURT.

Remark how much better this lady's leisure was employed than it would have been in idle dissipation or slothful indolence: her works remain a testimony of her industry and taste, and will long preserve her name from oblivion. The ancient manner of painting on glass was very simple, and consisted in the mere arrangement of pieces of glass of different colours, in some sort of symmetry, and constituted a species of what we call mosaic work. In time, the taste for this kind of work improved; and the art being found applicable to the adorning of churches and other public buildings, they found means of incor-

porating the colours with the glass itself, by exposing them to a proper degree of fire, after the colours are laid on.

MR. HARCOURT.

There is an easy method of painting small pictures on glass, called back-painting, which requires but little skill, and produces a pretty effect. You must take a piece of crown glass, the size of the print you intend to paint; (a metzotinto is the best adapted to the purpose;) soak your print in clear water for forty-eight hours, if it be on very strong, close, hard-gummed paper; but if on a soft, spongy paper, two hours will be sufficient: then lay the print between four sheets of paper, two beneath it and two above it, that the moisture may be drawn out of it. In the mean while, let the glass be warmed at the fire; then with a hog's hair brush, dipped in melted Strasburg turpentine, smear the glass smoothly and evenly. Lay the print upon the glass, rubbing it gently from one end to the other, that it may lie close. With the finger rub off the paper from the backside of the print, till nothing
can

can be seen but the print, like a thin film, upon the glass, and set it aside to dry. When it is well dried, varnish it over with some white, transparent varnish, that the print may be seen through it, which is now fit for painting. Having prepared a variety of oil colours, which must be ground very fine, and tempered very stiff, lay such colours on the transparent print as your fancy and taste direct, the outlines of the print guiding the pencil, and it will produce a very pretty effect. You must be careful to lay on the colours thick enough to appear plainly through the glass.—When your grotto is finished, you may exercise yourselves this way, and each of you produce a picture, though much inferior to those works that require the hand of an artist, yet affording amusement for a leisure hour, and varying the course of your occupations. Adieu, my dear children: I wish you repose and pleasant dreams.

CONVERSATION X.

HENRY.

MAY I be allowed to chuse a subject for this evening. I want to know what sugar is made of. I heard Mr. Jenkins say it was a salt; and I think he must be mistaken, for I cannot taste the least flavour of salt in it.

MR. HARCOURT.

Chemically considered, he is in the right. Sugar is a sweet, agreeable, saline juice, expressed from many different kinds of vegetables. Carrots, parsnips, white and red beets, yield sugar; but the plant from which the sugar that is generally used is procured, is the sugar-cane, a sort of reed, that grows in great plenty in both the East and West Indies. Sophia, endeavour to give us a botanical definition of it.

SOPHIA.

SOPHIA.

It is a genus of the triandria digynia class. Its characters are, that it has no empalement; but instead of it a woolly down, longer than the flower that encloses it. The flower is bivalve; the valves are oblong, acute pointed, concave, and chaffy. It has three hair-like stamina, the ends of the valves terminated by oblong summits; and an awl-shaped germen, supporting two rough styles, crowned by single stigmas: the germen becomes an oblong, acute-pointed seed, invested by the valves. It is cultivated in both the Indies for its juice, which, when boiled, affords that sweet salt which is called sugar.

MR. HARCOURT.

The canes grow from eight to twenty feet high; they are jointed, and at each joint are placed leaves. They are propagated by cuttings, which are generally taken from the tops of the canes, just below the leaves. A deep soil and light land are most suitable to the sugar-plant, and the rainy season is the proper time for planting it. The ground should

be marked out by a line, that the canes may be regularly disposed, and at equal distances. The common method of planting them is to make a trench with a hoe, which is performed by the hand; into this trench a negro drops the number of cuttings intended to be planted, which are planted by other negroes, who follow him; and the earth is drawn about the hills with a hoe.

CHARLES.

I fancy agriculture is not so well understood in the Indies as it is in Europe, or they would make use of the plough in those operations, as it would perform the work both more expeditiously, and in a completer manner than can be done by the hand. What length of time, and what multitudes of hands, would it occupy to hoe up all the land in England, that is to be sowed with corn every season!

MR. HARCOURT.

Horses are very scarce in the West Indies especially, and almost all laborious operations are performed by the hands of negro slaves.

AUGUSTA.

Are those countries inhabited by negroes? I understood that they were the natives of Africa.

MRS. HARCOURT.

You were rightly informed, my dear; they are indeed natives of Africa, but have been snatched from their own country, friends, and connections, by the hand of violence and power. I am ashamed to confess that many ships were annually sent from different parts of England, particularly Bristol and Liverpool, to the coast of Guinea, to procure slaves from that unhappy country, for the use of our West-India islands, where they were sold to the planters of sugar plantations, in an open market, like cattle, and afterwards employed in the most laborious and servile occupations, and are still obliged to pass the rest of their lives in an involuntary and wretched slavery.

SOPHIA.

How much my heart feels for them! How terrible must it be to be separated from one's near relations! Parents, perhaps, divided from their children for ever; husbands from their

wives; brothers and sisters obliged to take an eternal farewell. Why did the kings of the African states suffer their subjects to be so cruelly treated?

MRS. HARCOURT.

Many causes have operated to induce the African princes to become assistants in this infamous traffic; and instead of being the defenders of their harmless people, they have frequently betrayed them to their cruellest enemies. The Europeans have found the means of corrupting these ignorant rulers, with bribes of rum or other spirituous liquors, of which they are immoderately fond. At other times they have fomented jealousies and excited wars between them, merely for the sake of obtaining the prisoners of war for slaves. Frequently they have used no ceremony, but have gone on shore in the night, set fire to a neighbouring village, and seized upon all the unhappy victims who ran out to escape the flames.

CECILIA.

What hardened hearts must the captains or
those

those ships have had ! They must have become extremely cruel, before they would undertake such an employment.

MRS. HARCOURT.

It is much to be feared that most of them, by the habits of such a life, became deaf to the voice of pity ; but we must compassionate the situation of those whose parents early bred them to this profession, before they were of an age to chuse a different employment.—But to resume the subject of the negroes. What I have related was only the beginning of their sorrows. When they were put on board the ships, they were crowded together in the hold, where many of them died from want of air and room. There have been frequent instances of their throwing themselves into the sea, when they could find an opportunity, and seeking a refuge from their misfortunes in death. As soon as they arrived in the West-Indies, they were carried to a public market, where they were sold to the best bidder, like horses at our fairs. Their future

lot depended upon the disposition of the master into whose hands they happened to fall; for among the overseers of sugar-plantations there are some men of feeling and humanity; but too generally their treatment is very severe. Accustomed to an inactive, indolent life, in the luxurious and plentiful country of Africa, they find great hardships from the transition to a life of severe labour, without any mixture of indulgence to soften it. Deprived of hope of amending their condition, by any course of conduct they can pursue, they frequently abandon themselves to despair, and die in what is called the seasoning, which is becoming inured, by length of time, to their situation. Those who have less sensibility and stronger constitutions, survive their complicated misery but a few years: for it is generally acknowledged that they seldom attain the full period of human life.

AUGUSTA.

Humanity shudders at your account; but I have heard a gentleman, that had lived many years abroad, say, that negroes were not much

superior to the brutes; and that they were so stupid and stubborn, that nothing but stripes and severity could have any influence over them.

MR. HARCOURT.

That gentleman was most probably interested in misleading those with whom he conversed. People who argue in that manner do not consider the disadvantages the poor negroes suffer from want of cultivation. Leading an ignorant, savage life in their own country, they can have acquired no previous information: and when they fall into the hands of their cruel oppressors, a life of laborious servitude, which scarcely affords them sufficient time for sleep, deprives them of every opportunity of improving their minds. There is no reason to suppose that they differ from us in any thing but colour, which distinction arises from the intense heat of their climate. There have been instances of a few, whose situations have been favourable to improvement, that have shown no inferiority of

capacity: and those masters, who neglect the religious and moral instruction of their slaves, add a heavy load of guilt to that already incurred by their share in this unjust and inhuman traffic.

CHARLES.

My indignation arises at this recital. Why did not the British parliament exert its power, to avenge the wrongs of these oppressed Africans? What could have prevented an act of parliament being passed, to forbid Englishmen from buying and selling slaves.

MR. HARCOURT.

Mr. Wilberforce, a name that does honour to humanity, made several fruitless efforts to obtain an act for the abolition of this trade. Men, interested in its continuance, have till lately frustrated his noble design; but the goodness of that Divine Providence who careth for all creatures, has at length caused their rights to be considered; and the present generation, in this instance, have preferred justice and mercy to interest and policy; and have freed themselves from the odium they formerly

suffered, of treating our fellow-creatures in a manner unworthy of them and of ourselves.

MRS. HARCOURT.

Henry, repeat that beautiful apostrophe to a negro woman, which you learned the other day out of M^s. Barbauk's Hymns.

HENRY.

“ Negro woman, who sittest pining in captivity, and wepest over thy sick child,
“ though no one seeth thee, God seeth thee;
“ though no one pitieth thee, God pitieth thee. Raise thy voice, forlorn and abandoned one; call upon him from amidst thy
“ bonds, for assuredly he will hear thee.”

CECILIA.

I think no riches could have tempted me to have had any share in the slave trade. I could never have enjoyed peace of mind, whilst I thought I contributed to the woes of my fellow-creatures.

MR. HARCOURT.

But, Cecilia, to put your compassion to the proof, would you have been willing to have debarred yourself of the many indulgences

that we enjoy, that are the fruit of their labour? Sugar, coffee, rice, calico, rum, and many other articles, are procured by the sweat of their brow.

CECILIA.

I would still forego any indulgence to alleviate their sufferings.

The rest of the Children together.

We are all of the same mind.

MRS. HARCOURT.

" I admire the sensibility of your uncorrupted hearts, my dear children. It is the voice of nature and virtue. Listen to it on all occasion, and bring it home to your bosoms and your daily practice. The same principle of benevolence which excites your just indignation at the oppression of the negroes, will lead you to be gentle towards your inferiors, kind to your equals, and in a particular manner condescending and considerate towards your domestics; requiring no more of them than you would be willing to perform in their situation; instructing them when you have opportunity; sympathizing in their afflictions,

and promoting their best interests when in your power.

AUGUSTA.

My governess forbids me ever to speak to the servants; therefore I cannot show them any kindness, without disobeying her.

MRS. HARCOURT.

Your governess shows her discretion in forbidding you to be familiar with the servants. Their want of education renders them improper companions; but can never deprive them of their claim to our tenderness and good offices.

MR. HARCOURT.

It is time to proceed in our account of the process of preparing the juice of the sugar-canes for use. When the canes are ripe, they are cut and carried in bundles to the mill. The mills consist of three wooden rollers, covered with steel plates, and are set in motion either by water, wind, cattle, or even the hands of slaves. The juice being squeezed out of the canes, by the rollers, runs through a little canal into the sugar-house, where it

falls into a vessel, from whence it is conveyed into the first copper. With this liquor is mixed a quantity of ashes and quick lime, which serves to purify it, by raising up the unctuous matter, in form of a scum, to the top, which is skimmed off and given to poultry. This operation is performed five or six times, till the sugar be sufficiently purified, and become of a proper thickness, to be converted into the various kinds for use. It is then put into hog-heads and sent over to England to the care of the sugar-refiners, whose business it is to complete the process, by boiling it up with bullocks' blood, in order to clear it. Sometimes whites of eggs are used for the same purpose. They add a little of the finest indigo to give it a good colour. It is boiled over again, that the moist parts may evaporate. The next thing to be done is to fill the moulds, which are in the form of inverted cones. The rooms in which these moulds are placed are properly heated, to dry the sugar they contain. When the loaves are
fully

fully dried, they are prepared and sold to the grocer.

HENRY.

Are sugar-candy and barley-sugar made from the sugar-cane? They are different from sugar both in taste and colour.

MR. HARCOURT.

The material is the same, although the preparation varies. Sugar-candy is sugar crystallized. It is first dissolved in a weak lime-water, then clarified, scummed, strained through a cloth, and boiled. It is afterwards put into forms or moulds, that are crossed with threads to retain the sugar as it crystallizes. These forms are suspended in a hot stove, which is shut up, and the fire made very vehement. Upon this the sugar fastens to the strings that cross the forms, and there hangs in little splinters of crystal. When the sugar is quite dry, the forms are broken, and the sugar is taken out candied. Red sugar-candy is coloured, by pouring a little juice of the Indian fig into the vessel, whilst the sugar is boiling. Barley sugar is sugar boiled till it

is brittle, and then poured on a stone anointed with oil of sweet almonds, and formed into twisted sticks. It should be boiled up with a decoction of barley, whence it takes its name; they sometimes cast saffron into it, to give it the bright amber colour.

MRS. HARCOURT.

Sugar is a very useful commodity. It preserves both animal and vegetable substances from putrefaction; and we are indebted to it, on this account, for all the variety of conserves and sweetmeats which adorn and enrich our repasts. White sugar-candy is used by miniature-painters to prevent the colours from cracking, when mixed with gum-arabic; and Henry need not be told how useful barley-sugar is in coughs and hoarsenesses.

MR. HARCOURT.

It is supposed that, although the ancients were acquainted with this plant, they were ignorant of our method of refining and preparing it. The first account we have of sugar-refiners in England, is in the year 1659. Several other things are produced from the
sugar

sugar-cane. Treacle is the syrup that runs from the barrels of raw sugar. Rum is distilled from the sugar-cane.

CHARLES.

Is not arrack also made from sugar?

MR. HARCOURT.

It is sometimes distilled from rice and sugar, fermented with the juice of cocoa-nuts; but it is generally distilled from a vegetable juice called toddy, which flows, by incision, out of the cocoa-nut tree, like the birch-juice procured among us for wine. The sugar-house of a refiner is a large building, consisting of six or seven floors; and the utensils necessary to perform the different operations require the aid of various kinds of workmen. The pans, coolers, cisterns, syrup-pipes, basons, ladles, skimmers, and sometimes the candy-pots, are made of copper. Pipes, pumps, and cisterns made of lead are also used. The iron-founder supplies bars of a triangular form, to be laid under the pans; also the cockel, which is an iron trunk used to dry the goods in the stove; iron doors, &c. The carpenter is required

to furnish racks, troughs, stools, blocks, coolers, oars, &c. Tubs and backs to hold the lime-water, which contain from thirty to two hundred barrels, employ the back-maker. The wicker-work consists of refining baskets, scum-baskets, pulling-up baskets, coal and clay-baskets, &c. Thus, if we consider the numbers employed in building the ships used in bringing over the sugar, planters, overseers, &c. we may suppose that we do not taste a lump of sugar that is not produced by the united labour of a thousand hands.

SOPHIA.

And yet we use the conveniences of life in a careless, wasteful manner, without reflecting one moment on the trouble necessary to procure them. May I relate the manner of obtaining the maple-sugar, which some have endeavoured to introduce in the room of the produce of the sugar-cane.

MRS. HARCOURT.

By all means; it will give us pleasure to hear it.

SOPHIA.

SOPHIA.

The *acer saccharinum*, or the sugar-maple-tree, grows in great numbers in the western countries of all the middle states of the American Union. These trees are generally found mixed with the beech, hemlock, white and water ash, the cucumber-tree, linden, aspen, butter-nut, and wild cherry-trees. They grow only on the richest soils, and frequently in stony ground. Springs of the purest water abound in their neighbourhood. They are, when fully grown, as tall as the white and black oaks, and from two to three feet in diameter. They put forth a beautiful white blossom in the spring, before they show a single leaf. The wood of the maple-tree is extremely inflammable. Its small branches are so much impregnated with sugar as to afford support to the cattle, horses, and sheep of the first settlers, during the winter, before they are able to cultivate forage for that purpose. Its ashes afford a great quantity of pot-ash, exceeded by few of the trees that grow in the woods of the United States. The tree is sup-

posed to arrive at its full growth in twenty years. It is not injured by tapping; on the contrary, the oftener it is tapped the more syrup it yields. The effects of a yearly discharge of sap from the tree, in improving and increasing the sap, are demonstrated from the superior excellence of those trees, which have been perforated in an hundred places, by a small wood-pecker, which feeds upon the sap. The method of obtaining the sap is by boring a hole in a tree with an augur: a spout is introduced about half an inch into the hole made by the augur. The sap flows from four to six weeks, according to the temperature of the weather. Troughs are placed under the spout to receive the sap, which is carried every day to a large receiver, whence it is conveyed, after being strained, to the boiler. There are three modes of reducing the sap to sugar; by evaporation, by freezing, and by boiling, of which the latter is the most expeditious. The profit of this tree is not confined to its sugar. It affords a most agreeable molasses, and an excellent vinegar.

The

The sap, which is suitable for these purposes, is obtained, after the sap which affords the sugar hath ceased to flow ; so that the manufactories of these different products of the maple-tree, by succeeding, do not interfere with each other. The molasses may be used to compose the basis of a pleasant summer beer. The sap of the maple is moreover capable of affording a spirit. A tree so various in its uses, if duly cultivated, might one day have supplied us with sugar, and have silenced the arguments of the planters for a continuance of the slave trade.

MR. HARCOURT.

Very philosophically observed. We thank you for your entertaining account, and wish you good night, as it is already past the usual time of separation.

CONVERSATION XI.

CECILIA.

I THANK you, dear mamma, in the name of my brothers and sisters, for the pleasure you have given us, in allowing us to accept Farmer Dobson's invitation to his sheep-shearing. We have passed a very agreeable afternoon, both from the civility of the honest farmer and his wife, and the novelty of the scene, which was very striking to us, as we had never seen any thing of the kind before. It reminded me of Thomson's description of a sheep-shearing, which, with your leave, I will repeat.

MRS. HARCOURT.

It will give me great pleasure to hear it, provided you are careful to speak slowly, distinctly, and to give every word its proper emphasis.

CECILIA.

CECILIA.

In one diffusive band,
They drive their troubled flocks, by many a dog
Compell'd, to where the mazy running brook
Forms a deep pool; this bank, abrupt and high,
And that far-spreading in a pebbled shore.
Urg'd to the giddy bank, much is the toil,
The clamour much, of men, and boys, and dogs,
Like the soft fearful people to the floods
Commit their woolly flocks. And oft the swain,
On some impatient seizing, hurls them in.
Embolden'd then, nor hesitating more,
Fast, fast they plunge amid the flashing wave,
And, panting, labour to the furthest shore.
Repeated this, till deep the well-wash'd fleece
Has drunk the flood, and from his lively haunt
The trout is banish'd by the sordid stream;
Heavy, and dripping, to the breezy brow,
Slow move the harmless race: where, as they spread
Their swelling treasures to the sunny ray,
Inly disturb'd, and wondering what this wild
Outrageous tumult means, then loud complaints
The country fill, and, toss'd from rock to rock,
Incessant bleatings run around the hills.
At last, of snowy white, the gather'd flocks
Are in the wattled pen innumerable press'd,
Head above head; and rang'd in lusty rows,
The shepherds sit, and whet the sounding shears.

The housewife waits to roll her fleecy stores,
With all her gay-dress'd maids attending round.
One, chief, in gracious dignity enthron'd,
Shines o'er the rest, the past'ral queen, and rays
Her smiles, sweet beaming, on her shepherd king;
While the glad circle round them yield their souls
To festive mirth, and wit that knows no gall.
Meantime, their joyous task goes on apace:
Some mingling stir the melted tar; and some,
Deep on the new-shorn vagrant's heaving side,
To stamp his master's cypher ready stand;
Others th' unwilling wedder drag along;
And, glorying in his might, the sturdy boy
Holds by the twisted horns th' indignant ram.
Behold, where bound, and of its robe bereft,
By needy man, that all-depending lord,
How meek, how patient, the mild creature lies
What softness in its melancholy face,
What dumb complaining innocence appears.
Fear not, ye gentle tribes, 'tis not the knife
Of horrid slaughter that is o'er you wav'd;
No, 'tis the tender swain's well-guided shears,
Who having now, to pay his annual care,
Borrow'd your fleece, to you a cumbrous load,
Will send you bounding to your hills again.

MRS. HARCOURT.

Tolerably well repeated. A general acquaintance with the best English poets, united with a retentive memory and graceful enunciation, will furnish the rare and delightful accomplishment of repeating selected passages, which may supply an elegant amusement for the vacant hour of domestic leisure, and prevent that lassitude so frequently complained of at home, which compels so many to seek a refuge from themselves in dissipation and fashionable pleasure.

SOPHIA.

My time is so variously filled up, that I never experience that wearisomeness.

MRS. HARCOURT.

A well chosen succession of employments is the best antidote against *ennui*, as it is termed by the French, or listlessness. Reading, drawing, natural history in its different branches, simple mathematics, experimental philosophy, with various other rational pursuits, are admirably calculated to fill up the leisure hours of persons in easy circumstances, whose duties

or business afford them opportunity for such studies.

MR. HARCOURT.

It is a just observation, that none but the idle want employment. The active mind collects amusement from the most trifling events. Cannot a sheep-shearing supply us with a hint for the subject of our present conversation? Sophia, endeavour to entertain us with the natural history of the sheep.

SOPHIA.

Sheep, according to Linnaeus, are of the order of pecora, and make a distinct genus. The characters which distinguish them are, that their horns are hollow, bent backward, wreathed, crooked, and scabrous. They have eight cutting teeth in the lower jaw, but none in the upper, and no canine teeth. The wool of these animals consists only of long, slender hairs, much twisted, and variously interwoven with one another. This clothing is peculiar to the sheep kind, so far as is yet known, no other animal having been discovered with a similar covering; neither is it possessed by all

the species of sheep, some of those of the distant nations having short hair, like that of the goat.

MR. HARCOURT.

In addition to your general account of the sheep, I will enumerate the species, and their peculiarities, which, according to the same great master of natural arrangement, Linnaeus, are three: first, the *ovis aris*, or ram sheep, which comprehends many varieties, such as the common sheep, with large horns twisted spirally and outwardly: the hornless sheep, with the tail hanging down to the knees; this kind is common in many parts of England: the Spanish, or many-horned sheep, having usually three horns, and sometimes four or five; this sort of sheep is frequent in Iceland, Siberia, and other northern countries: the African sheep, which has short hair, like that of the goat: and the broad-tailed sheep, which is common in Syria, Barbary, and Ethiopia. The tails of these are so long as to trail upon the ground, and the shepherds are obliged to put boards with small wheels under them, to keep

keep them from galling. These tails are esteemed a great delicacy, being of a substance between fat and marrow; they sometimes weigh fifty pounds each. The broad-tailed sheep are also found in the kingdom of Thibet; and their fleeces are equal to those of Caramania, in fineness, beauty, and length. The Cackeminians engross this article, and have factories in all parts of Thibet, for buying up the wool, which they work up into those elegant shawls, that are brought into this country from the East Indies; and this manufacture supplies them with a considerable source of wealth. The second species is the *ovis Guiniensis*, commonly called the Angola sheep. They are long-legged and tall, and their ears hang down: the horns are small and bending down to the eyes: the neck is adorned with a long mane: the hair of the rest of the body is short; and it has wattles on the neck. The third species is the *ovis strepsiceros*, or Cretan sheep, with horns quite erect, twisted like a screw, and beautifully furrowed on the outside. This kind is common

mon in Hungary ; and large flocks of them are found on Mount Ida, in Crete. The manners of this animal are naturally harmless and timid. It threatens by stamping with its foot ; but its only resistance is by butting with its horns. It generally brings one young one at a time, sometimes two, and rarely three. It is a valuable animal to the farmer, as it is kept at the least expence of any, and will thrive upon almost any pasture-ground, not particularly wet : a constant damp causes them to rot.

MRS. HARCOURT.

Almost every part of it may be applied to some useful purpose. The flesh is a delicate and wholesome food. The skin, when dressed, forms different parts of our apparel, as shoes and gloves ; it is also used for covers of books. The entrails, properly prepared and twisted, are used in clocks, and various musical instruments. The bones, calcined, form materials for tests for the refiner. The milk is thicker than that of cows, and consequently yields a greater quantity, in proportion, of

butter and cheese; and even the dung is useful as a rich manure: but the most valuable part of all is the fleece, or wool, which, when washed, shorn, dressed, combed, spun, and wove, makes a great variety of stuffs and cloths, suitable both for clothing and furniture, and was so highly valued by the ancients for its utility, as to have given rise to the story of the golden fleece, which I request the favour of Charles to relate.

CHARLES.

The ancients, always fond of fables, concealed the simplest events under the appearance of some extraordinary story. Jason, son of Æson, king of Thessaly, sailed in the first large ship (called Argo) to fetch the golden fleece from Colchis. Fifty-four brave Thes-salians accompanied him in his expedition, and, from the name of the vessel, are called Argonauts. Their object is supposed to have been the establishment of a profitable trade in wool, in which that country excelled. The difficulties he met with in his undertaking, and which he overcame by his prudence, are represented

represented by the fable of a dragon, that guarded the fleece, and which he is said to have killed, by the assistance of Medea, an enchantress. The education this prince had received from Chiron, the centaur, famous for his arts and learning, had fitted him for cultivating commerce, and promoting useful discoveries. Jason at length reigned, and died peaceably at Colchis.

SOPHIA.

Another proof of the high veneration that was paid to the inventors of the woollen manufacture, is, that the art of preparing it was attributed to Minerva, the goddess of wisdom, and the protectress of the useful arts.

CECILIA.

We have been entertained with a history of the sheep, and a general account of its uses ; but I am very desirous of knowing the manner of working wool, and rendering so rough a material fit for the purposes of spinning and weaving fine cloth.

MRS. HARCOURT.

Various are the operations it undergoes before it is in a proper state for the purposes you mention. The fleeces, when taken out of the bales into which they are packed after shearing, must be scoured. When the wool has continued long enough in the liquor to dissolve and loosen the grease, it is taken out, and well washed and dried : it is then beaten with rods, or hurdles of wood, to clear it of the dust and grosser filth. The next thing is to pick it, and oil it with oil of olives. It is now given out to the spinners, who first card it on the knee; that is, pass it between the points or teeth of two instruments, something like a curry-comb, called cards, to disentangle it, and prepare it for spinning, which is an operation too common to need description. The thread or worsted being spun, reeled, and made into skeins, is ready for the hand of the weaver, who begins his work by putting the warp, or threads, the long way of the piece, into the loom, which he stiffens with size before he forms the woof, which is done by throwing

throwing the thread with a shuttle across the warp, till the work be finished ; when it is to be cleared of all knots, &c. and carried to the fuller to be scoured and cleansed, ready for dyeing ; after it is dyed, it is pressed and prepared for sale. Different kinds of goods require variation in the process, according to the kind of stuff intended to be made.

AUGUSTA.

Wool is applied to a vast many different purposes? what are the principal manufactures in which it is employed?

MR. HARCOURT.

Let Henry endeavour to enumerate the things that we use that are made of wool.

HENRY.

Broad cloths for men's coats, flannel, blankets, carpets, rugs, caps, stockings, and various kinds of stuffs.

CECILIA.

All stockings are not knitted: how are the others made?

MR. HARCOURT.

They are wove in a machine, called a stocking-

stocking-frame, very ingeniously contrived, but too complex to give you any idea of by description. Wool is the staple commodity of this island, and forms the principal article in our foreign and domestic trade. The yearly produce of wool in England, towards the close of the last century, was calculated at two millions sterling, and consequently it gives employment to a vast number of hands. A pack, or two hundred and forty pounds weight of short wool, is computed to employ sixty-three persons a week, to manufacture it into cloths: and when it is made into stuffs or stockings, it employs a much greater number.

CHARLES.

The working of wool is doubtless an invention of great antiquity; but how long has it been introduced into England?

MR. HARCOURT.

It may be said to have arisen into notice about the fourteenth century. King Edward the Third introduced the fine woollen manufacture from the Netherlands. Queen Elizabeth

both greatly improved the state of this manufacture by her patronage, in which she received considerable assistance from the troubles in the Low Countries, excited by the severity of the Duke of Alva and the Spanish inquisition, on account of religion, which drove numbers of manufacturers to take shelter in England, where they enjoyed protection and encouragement to settle. Contrast the conduct of Elizabeth and the Duke of Alva. The one cherished the useful arts, and diffused happiness and wealth among her people; the other, from a gloomy superstition, deprived his country of useful manufacturers, and obliged them to take refuge in the dominions of his rival, which they enriched by their labours and skill.

MRS. HARCOURT.

Nature is an excellent instructress. From the nautilus men learned the art of sailing; from the spider they are supposed to have been taught the art of weaving; attention to natural objects will probably supply new discoveries, which are now unthought of.

CHARLES

CHARLES.

What country produces the finest wool?

MR. HARCOURT.

The wool of Asia excels that of Europe. Of the European, none is more valued than the Spanish and the English. Spain is famous for its breed of sheep. They have frequently ten thousand in a flock, under the care of fifty shepherds, who are subservient to the authority of one man.

HENRY.

I think I should like to be a shepherd : it must be an easy, pleasant life.

MRS. HARCOURT.

They generally pass their time in a very indolent, useless manner ; though some in the north of England knit stockings : yet it appears to me that a better plan of employment might be suggested for them, without interfering with their principal occupation. Those who could read and write might keep a register of the weather, and make observations upon the natural objects that presented themselves to their view,

view, which might be a means of promoting useful knowledge.

CHARLES.

Is it not the custom of the lord chancellor, the judges, and masters in chancery, to be seated on woolstacks, in the House of Lords?

MR. HARCOURT.

That is a custom not very easy to be accounted for, unless it be to remind them of protecting and maintaining the woollen manufactures of this country.

MRS. HARCOURT.

It is time to put an end to our conversation. Supper is ready. Good night, children.

CONVER-

CONVERSATION XII.

MRS. HARCOURT.

AS the woollen manufacture seemed to afford us great entertainment the last time we met, may we not be amused by the various branches of the linen and cotton manufactures? Sophia has made herself acquainted with the natural definitions of both flax and hemp, with the design of contributing materials for our conversation.

MR. HARCOURT.

We cannot adopt a more suitable subject ; the one leads the way to the other. In the early, savage state, when men united in small societies, for the sake of protection and defence, we find they clothed themselves with the skins of beasts, in their rough, natural state, unimproved by art or dressing, merely for the purposes of decency and warmth. In cold climates, the savage tribes frequently wear the hair inwards. As they advance to a
higher

higher state of civilization, they make use of materials that admit of greater skill in preparing, and study ornament as well as use. Captain Cook relates, that the inhabitants of some places he visited have a method of weaving cloth of a certain species of grass. The natives of Atooi make cloths and caps of feathers, with great ingenuity, on which they set a high value, and which appear to be appropriated to the chiefs and great men of the country. Many of the islands in the South Sea, are so far advanced towards civilized life, as to have an established manufacture of cloth, which is made by the women. They take the stalks or trunks of the paper-mulberry, which rarely grows more than seven feet in height, and about the thickness of four fingers. From these stalks they strip the bark, and scrape off the exterior rind; after which the bark is rolled up, and softened for some time in water; it is then beaten with a square instrument of wood full of coarse grooves, but sometimes with a plain one. When sufficiently beaten, it is spread out to dry; the piece
being

being from four to six or seven feet in length, and about half as broad. These pieces are joined by smearing part of them with the glutinous juice of a berry called Tooō; and, after being thus lengthened, they are placed over a large piece of wood, with a sort of stamp, composed of a fibrous substance, laid beneath them. The manufacturers then take a bit of cloth, and, having dipped it in a juice expressed from the bark of a tree called kokka, rub it briskly over the piece that is making. This leaves a dry gloss, and a dull brown colour upon the surface; and the stamp makes, at the same time, a slight impression, which finishes the work. But when we compare these simple works with the variety, elegance, and utility, of the manufactures of the polished nations of Europe and Asia, the degrees of refinement and civilization are clearly marked; and we are enabled to form distinct ideas of the difference between the rude productions of the untutored mind, and those which are the result of science and art.—But I am wandering from our subject. Sophia,
your

your young friends wait impatiently to hear your account of flax and hemp, which form the materials of the linen of this country, from the coarsest cloth to the finest lace.

SOPHIA.

Flax is a genus of the petandria, pentagynia class. The flower has a permanent empalement, composed of five small spear-shaped, acute leaves; five large, oblong, petals, and five awl-shaped erect stamina, terminated by arrow-shaped summits. In the centre is situated an oval germen, supporting five slender styles, crowned by reflex stigmas, which turn to a globular capsule with ten cells, opening with five valves; in each cell is lodged one oval, smooth seed, with an acute point. There are fourteen species. The common flax is an annual plant, that will grow in any kind of good, sound land. The best land yields the best flax.

CHARLES.

As the tilling and ordering of flax is so profitable to the farmer, I regret it is not more frequently cultivated.

MR. HARCOURT.

Since you seem to be acquainted with the management of it, pray tell us the seasons for sowing and gathering it.

CHARLES.

The time of sowing is the latter end of March. The best way of sowing flax-seed is to drill it in equidistant rows, about ten inches from one another. Towards the end of August the flax will begin to ripen, and must be pulled as soon as the seed grows brown, and bends down the heads.

MR. HARCOURT.

Riga supplies us with the best seed. Scotland and Ireland import great quantities from thence annually. Flax and hemp have the remarkable property of communicating a poisonous quality to water, when laid in it for the purpose of decaying the stem, and procuring the bark for mechanical purposes, so that cattle die that drink of it.

AUGUSTA.

I am quite unacquainted with the manner of making linen from a plant. Mr. Harcourt
said

said just now, that hemp and flax formed the materials of linen. I thought linen had been made of thread.

CECILIA.

So it is; but all the various sorts of thread we use are made of flax.

MRS. HARCOURT.

Hemp is very similar to flax in its culture and use; therefore, one description of the manner of preparing them will be sufficient for both. When they gather it, they pull it up by the roots, after which they bind it up in bundles. They comb out the heads on the teeth of a ripple, which pulls off the leaves, the husks of the seeds, and the seeds themselves together. These are gathered in a heap, and left in that condition for a few days, in order to heat a little; after which they are spread out to dry before they are threshed, and the seeds are separated by winnowing and sifting. Then, in order to rot the bark, they are laid in water, that it may be more easily separated from the reed. When it is sufficiently rotted, the stalks are dried in an oven or

kiln. The next thing to be done is peeling off the bark, which is performed by various means ; but it is most expeditiously effected by mills.

HENRY.

Do not people beat hemp in Bridewell?

MR. HARCOURT.

The beating hemp with beetles is a very laborious employment, and is used as a punishment for the idle and dissolute, who are confined there for small crimes.

MRS. HARCOURT.

In order to complete the process, they beat it till it is soft and pliable, and, after washing and bleaching, it is heckled with instruments resembling a wool-dresser's comb, to disentangle the shorter tow from the longer, which is then fit to be spun into thread, for the different purposes of weaving, &c.

AUGUSTA.

I am ashamed of my ignorance ; but it is wonderful to me to think that this piece of linen ever grew in a field.

MR.

MR. HARCOURT.

It is said, that the first step to knowledge is a consciousness of ignorance. Endeavour, children, to increase your stock of useful knowledge daily, by attention to every thing you see and hear. There are various kinds of linen, the principal materials of which are flax, cotton, and hemp. The linen trade of Europe is chiefly in the hands of the Russians, Germans, Flemings, Hollanders, French, and Irish. Cotton is a woolly or downy substance, which encloses the seed, and is contained in a brown husk, or seed-vessel, of a certain plant, that grows both in the East and West Indies. There are several species of this plant cultivated in different places. Cotton forms a very considerable article of commerce: it is distinguished into two sorts; cotton in the wool, and spun cotton. The first is quilted between two stuffs, and is made use of for the purpose of rendering them thick and warm, as for coverlids for beds, petticoats, &c. but the latter kind is of most general use, as, when spun and wove, it makes calicoes, cloths,

R S

muslins;

muslins, dimitics, besides a kind of quilting, ingeniously contrived to resemble that done with a needle. It is also frequently intermixed with silk or flax, in the composition of various kinds of stuffs. Manchester, long celebrated for various branches of the linen, silk, and cotton manufacture, is now conspicuous as the centre of the cotton trade.

CHARLES.

Cotton anciently grew only in Egypt, and was confined to the use of the priests and sacrificers, for a particular kind of gown, worn by them alone.

MRS. HARCOURT.

Although hemp does not form a material for works of so delicate a texture as flax and cotton, it deserves to be noticed for the many useful properties it contains. Of what use would our ships be, without ropes and sails? Sophia, you have performed but half your promise: I call upon you now to fulfil the other part of your engagement.

SOPHIA.

I am always ready to obey you. Hemp is
a species

a species of the dioecia pentandria class. It is male and female in different plants. The male flowers have a five-leaved concave empalement, without petals, but have five short hairy stamina, terminated by oblong, square summits. The female flowers have permanent empalements of one leaf, without petals, but a small germen, which afterwards becomes a globular, depressed seed, enclosed in the empalement. We have but one species of this plant, which is propagated in the rich fenny parts of *Lincolnshire*, in great quantities, for its bark, which is useful for cordage, cloth, &c.

CECILIA.

Oh! I remember my uncle showed me some, when I was on a visit at his house. It rises quickly into a tall, slender shrub; its stem is hollow, and, he told me, was frequently made into charcoal, and is used in that form in the composition of gunpowder. Its leaves arise from the same pedicle, and are a little jagged, yielding a strong smell, apt to
make

make one's head ache. The flowers grow in clusters, and the bark is a tissue of fibres, joined together by a soft matter, which easily rots away.

MR. HARCOURT.

It does not appear that the ancients were acquainted with the use of hemp, with respect to the thread that it affords. The moderns are not contented with that production only, but torture this poor plant for another valuable commodity that it contains. Henry can tell us what that is.

HENRY.

Oil: I have not forgotten what I saw at the mill. They bruise the seed of flax, (which is called linseed,) as well as hempseed, with vast hammers, which are too heavy for men to lift, and are set a going with wheels, which are turned by the stream of a river.

MR. HARCOURT.

You show a good memory. This oil has most of the qualities of the nut-oil, and is used as a substitute for it in painting. The oil drawn without the assistance of fire, is much

much esteemed in medicine, especially in the cure of catarrhs, coughs, asthmas, &c. After the oil is squeezed from the seeds, the seeds are heated over the fire, and being put into woollen bags, are pressed into pieces about twelve inches long, and six inches wide, called oil-cakes, and used to fatten cattle. These cakes, beaten again to dust, become an excellent manure for land. Thus, ingenuity and industry has applied almost every part of this plant to a valuable purpose.

CHARLES.

There is still one kind of linen cloth that we have not mentioned, and which I think more curious and extraordinary than any that has been described. If Augusta is surprised that linen should be spun from the fibres of plants, how much more astonished will she be to find that cloth has been made of stone!

AUGUSTA.

I am less inclined to disbelieve things that I do not understand, than I was when first your kind mother permitted me to join in these instructive conversations; since I have heard
many

many things equally new and wonderful to me, who had never been taught to observe or reflect upon the objects that fall in my way: but this time, Charles, I am really incredulous, and think you say this only to banter me.

CHARLES.

Nothing is more certain. I have seen and handled specimens of it; and, to increase the wonder of my tale, this cloth will not consume in the fiercest fire.

CECILIA.

Pray, Charles, explain it: this is an enigma that we cannot guess.

CHARLES.

There is a mineral substance, called asbestos, of a whitish or silver colour, and a woolly texture, consisting of small threads or fibres, endued with the wonderful property of resisting fire, and remaining unconsumed in the intensest heat. A method has been found of working these fibres into cloth and paper. This kind of linen was much esteemed by the ancients, being held equally precious

precious with the richest pearls. Pliny says, he had seen napkins made of it, which, when taken soiled from the table at a feast, were thrown into the fire, and were better **scoured** in that manner than they could have been if they had been washed in water: but the purpose for which it was so highly valued was the making of shrouds for royal funerals, to wrap up the corpse, so that the ashes of the deceased might be preserved distinct from those of the wood, &c. of which the funeral pile was composed. They also made the wicks of their perpetual lamps of the same material.

CECILIA.

Did not the ancients bury their dead in the same manner as we do?

MR. HARCOURT.

Different nations and ages have had various modes of disposing of their deceased friends and relations. The ancient Romans carried the body, borne on a bed or litter, covered with purple, and followed by the kindred of the deceased, to the rostra; and if he had
been

been a person of great quality, attended by old women, called *præficæ*, singing songs in his praise; and the funeral was preceded by waxen images of all his predecessors, borne on poles. When arrived there, the nearest of kin pronounced an oration, extolling his virtues and those of his ancestors; after which, they proceeded to the funeral pile, whereupon they laid the body, and set fire to the whole. The ashes were then carefully gathered up, and enclosed in an urn, which was placed in the sepulchre or tomb. The ceremonies of the Egyptians were very peculiar. They embalmed the body with aromatic spices and perfumes, in order to preserve it from decaying; and it is supposed that the pyramids, so wonderful for their antiquity and magnitude, were erected as monuments or tombs, to contain the bodies of their departed kings.

MRS. HARCOURT.

One of their customs pleases me much, as I think it was calculated to restrain vice and encourage virtue. They brought their
kings

to a form of trial after their death : those who were convicted of having oppressed their people, and leading bad lives, were deprived of the honours of burial, and their memories held in detestation ; but every respect was paid to those who had passed their lives in a virtuous manner ; and even durable monuments erected, to perpetuate their names, and transmit the recollection of their example to the latest posterity. To-morrow evening we shall select the silk manufacture, as a subject well suited to follow those of wool and linen, and forming a proper sequel to them. At present I find myself a little indisposed, and wish to retire early. Adieu, my dear children ; easy dreams and a good night to you.

CONVERSATION XIII.

MRS. HARCOURT.

ACCORDING to our agreement yesterday, we shall pursue the manufacture of silk, through its various operations, this evening; but as many of these are very similar to the same processes in those of flax and hemp, we shall only just mention them, and dwell more on the manners and metamorphoses of the minute labourer, whose skill supplies the finest palaces with their richest furniture, and without whose aid the habits of queens and princesses would be coarse and mean.

MR. HARCOURT.

Wool and flax are extremely valuable for their use, and are no more to be contemned in comparing them with silk, than iron is to be undervalued in comparison with gold and silver. The coarser metal, like the coarser materials

materials for cloth or stuff, is far more necessary for our accommodation, though less brilliant, and inferior for the purposes of ornament and splenour, than the more beautiful productions of the mine, or the silk-worm. Diamonds are dazzling to the eyes of the superficial observer; but were their real value subtracted from the adventitious price that refinement and luxury have raised them to, we, like the cock in the fable, should prefer something more useful and less shining.

CHARLES.

I cannot help remarking how sparing nature has been in those productions that are not of essential use, though highly prized, and sought with great avidity by the avarice of men.

MR. HARCOURT.

Nature, wise in all her ways, has bestowed the most useful things in the greatest abundance; and, in many instances, has rendered those objects which we are apt to despise for their minuteness and apparent insignificance, or because they are so common that

they do not call forth our attention, the most necessary to our subsistence and convenience.

MRS. HARCOURT.

The ancients were but little acquainted with the use and manufacture of the very soft, fine, bright, delicate thread, produced by the silkworm. It was a very scarce commodity among them for many ages. The art of manufacturing it was first invented in the isle of Cos: and Pamphila, daughter of Platis, is honoured as the inventress.

CHARLES.

It was not long unknown to the Romans, although it was so rare that it was even sold, weight for weight, with gold. And I have read that the emperor Aurelian, who died in the year 275, refused the empress, his wife, a suit of silk, which she solicited of him with much earnestness, merely on account of its dearness. Heliogabalus, the emperor, who died about half a century before Aurelian, is said to be the first person who wore a holosericum, or garment all of silk.

MR.

MR. HARCOURT.

The Greeks of Alexander the Great's army are supposed to have brought wrought silk first from Persia, into Greece, about three hundred and twenty-three years before Christ. But the manufacture of it was confined to Phœnicia, from whence it was dispersed over the West. Two monks, coming from the Indies to Constantinople, in 555, under the patronage of the Emperor Justinian, brought with them great quantities of silk-worms, with instructions for the hatching their eggs, rearing and feeding the worms, and spinning and working the silk; which was the means of establishing manufactures at Athens, Thebes, and Corinth. The Venetians, soon after this time, commencing a commerce with the Greek empire, supplied all the western parts of Europe with silks for many centuries. But various improvements have been made in the art since that time, such as damasks, velvets, &c. The rest of Italy and Spain, by degrees, learned this art, from some manufactories established by Roger the Second, king of Sicily, about

1150, in different parts of his dominions. And a little before the reign of Francis the First, the French became masters of it.

SOPHIA.

There was a company of silk women in England, so early as the year 1455.

MRS. HARCOURT.

It is most probable that they were only employed in needle-work of silk and thread ; for Italy supplied England with the broad manufacture, the chief part of the fifteenth century.

MR. HARCOURT.

Silk remained a rarity a long time in France. Their king, Henry the Second, is supposed to have worn the first pair of knit silk-stockings. After the civil wars the plantations of mulberry-trees were greatly encouraged by Henry the Fourth ; surnamed the Great, on account of the love he showed his people, and the true patriotism he displayed during his troublesome reign. His successors continued to patronise the culture of these trees, and the produce of silk is at this time very considerable

derable in that country. King James the First was very earnest to introduce it into England, but unhappily without effect. Although we have hitherto failed in rearing the worms, and raising raw silk of our own, the broad silk manufacture was introduced among us as early as the year 1620, and pursued with great vigour and advantage.

MRS. HARCOURT.

Greatly were we indebted to the tyranny and intolerance of our neighbours, the French, who, by the revocation of the Edict of Nantes, in 1685, (which means the repealing a law made in favour of Protestants,) drove vast numbers of their most skilful workmen in this branch, to take shelter in this island of liberty. They were kindly received, and settled in Spital-Fields, where they have carried on an ingenious and flourishing manufacture, till within these few years, that the British ladies have exchanged the wear of silk for that of calicoes and muslins, by which transition these poor manufacturers are reduced to a very distressed situation; being without employment,
and

and in want of most of the necessaries of life. It is an object worthy the consideration of persons of ability, to suggest some plan for turning the industry of so many hands into a different channel, and rendering them capable of maintaining their families, and becoming again useful to society. The silk-worm is an insect, not more remarkable for the precious matter it furnishes, than for the many forms it assumes. Cecilia, who keeps many of them, will amuse us with an account of these metamorphoses.

CECILIA.

From an egg, about the size of a pin's head, it becomes a small black worm, which daily increases till it is as large as a common caterpillar. During its worm state, it frequently changes its skin, and becomes by degrees of a light ash colour, inclined to yellow, and almost transparent when about to spin. Henry brings me fresh mulberry-leaves every morning to feed them with. When come to maturity, the silk-worm winds itself up in a silken bag or case, about the size and shape
of

of a pigeon's egg, it forms this ball by moving its mouth backwards and forwards, chusing some corner to begin its work in, and fastening its silk, with a kind of natural gum, to the sides, till it has entirely enclosed itself; always working from one single end, which it never breaks, unless disturbed; and it is so fine and so long, that I have read that those who have examined it attentively, think they speak within compass, when they affirm, that each ball contains silk enough to reach the length of six English miles. On opening this curious web, one is surprised to find a chrysalis or aurelia, instead of a silk-worm, which is brown, and about the size of a bean. In this state it remains for some time, apparently without life or motion, till at length out creeps a whitish moth, leaving the husk, or outer skin of the chrysalis, behind it. This is the last form it assumes; for, after having laid a multitude of eggs, it dies, and leaves them to be hatched by the warmth of the succeeding spring.

MRS. HARCOURT.

When the worm is supposed to have finished its work, which is generally in about ten days, the people who are employed in the care of these insects, for the sake of profit, collect the golden balls from off the mulberry-trees, to the leaves of which they glue their silk, and putting a handful of them into a copper of warm water, of a proper temperature to dissolve the gum, and occasion the silk to wind off more readily, having first pulled off a woolly coarse kind of silk, which covers the balls. They take the ends of twelve or fourteen cones at a time, and wind them off into skeins. In order to prepare this beautiful material for the hand of the weaver, to be wrought into silks, stuffs, brocades, satins, velvets, ribbons, gauzes, &c. it is spun, reeled, milled, bleached, and dyed, in a manner so similar to other materials, as to render a particular description unnecessary.

MR. HARCOURT.

There is a kind of silk, that we must not omit mentioning, which comes from the East-Indies,

Indies, and is not the work of the silk-worm, but comes from a plant, that produces it in pods, much like those of the cotton-tree. The matter this pod contains is extremely white, fine, and moderately glossy. It spins easily, and is used in several manufactures of Indian and Chinese stuffs.

SOPHIA.

I think I have heard of silk being spun from cobwebs.

AUGUSTA.

Surely that would be impossible, the threads are so fine and slender: besides, who would be willing to breed and tend spiders? I am terrified at the sight of one. How frightful would it be to enter a room where thousands are confined! I shudder at the thought.

MRS. HARCOURT.

Had you not unfortunately been brought up with this prejudice, you would have had no more fear of a spider than of any other insect. In this country they are harmless, and have far more reason to dread us than we have to be apprehensive of them. Use your
reason;

reason ; overcome such groundless fears : with men of sense they lay our sex under the imputation of affectation or ignorance, and savour strongly of vulgarity and want of education. When you have attentively considered the curious structure of this insect, and how wonderfully every part is adapted to its use, I believe you will be more inclined to look at it, in future, with an eye of admiration, than of terror.

MR. HARCOURT.

The secret has been discovered in France, within a few years, of procuring and preparing silk from spiders' webs, and the using it in several manufactures has been attempted. Spiders are distinguished by naturalists into several kinds, according to the construction of their parts ; but with regard to the silk spiders, they are reduced to two kinds, those with long legs, and those with short, which last furnish the finest raw silk. The silk it makes is nearly as beautiful, glossy, and strong, as that of the silk-worm ; the silk proceeds from five papilla or nipples placed under the belly, towards the
end

end of the tail. These serve as so many wire-drawing irons, to form and mould a viscous liquor, which, when dried in the air, as it is drawn through them, forms the silk. The threads are of two kinds; the first is weak, and only serves for that kind of web with which they catch flies. The second is much stronger, and is applied to wrap their eggs in, which, by means of this enclosure, are sheltered from the cold and the depredations of other insects. They wind these threads very loosely round the eggs, resembling the balls or bags of silk-worms, that have been prepared and loosened for the distaff. After having gathered twelve or thirteen ounces of these bags, M. Bon, the person who made these experiments, had them well beaten for some time, to get out all the dust; he then washed them in lukewarm water; after this he steeped them in a large vessel, with soap, salt-petre, and gum-arabic; when he boiled the whole, for three hours, over a gentle fire: the soap was then washed out of them, and the bags

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dried, to fit them for carding. Stockings and gloves were made of it, and presented to the Academy in Paris, as well as to our Royal Society in London. The great difficulty that remains to be surmounted, is the art of breeding and confining these voracious insects in a room together, as the natural fierceness of spiders renders them incapable of living in community. Four or five thousand, being distributed into cells, the larger ones soon killed and devoured the smaller; so that, in a short time, there was left scarcely more than one or two in a cell: and to this apparent unnatural propensity of eating one another, the scarcity of spiders is attributed, considering the vast numbers of eggs they lay. Every spider lays six or seven hundred. The young ones live ten or twelve months without eating, and continue in their bags without growing, till the warmth of the returning summer, putting their viscid juices in motion, induces them to come forth, spin, and run about in search of food.—But I believe Sophia is better
qualified

qualified to give us a lecture on the construction and manners of this extraordinary little creature.

SOPHIA.

With peculiar pleasure I shall relate what particulars I am acquainted with, as I am convinced that no one, who has examined its parts with a microscope, can behold it again as an object of abhorrence. Spider, a genus of the aptera order of insects : Linnæus enumerates forty-seven species. This insect affords to the sagacious observer, a great many curious particulars. As the fly (which is the spider's natural prey) is an animal extremely cautious and nimble, and usually comes from above, it was necessary the spider should be furnished with a quick sight, and an ability of looking upwards, forwards, and sideways at the same time ; and the microscope shows that the number, structure, and disposition of its eyes are wonderfully adapted to the serving all these purposes. Most spiders have eight eyes ; two on the top of the head or body, (for there is no division between them, the

spider having no neck,) these look directly upwards: there are two more in front, placed a little below these, and discovering all that passes forwards; and on each side, a couple more, one of which points sideways forwards, the other sideways backwards; so that it can see almost quite round. Whatever be the number of the spiders' eyes, (for there are not the same number in all the different species,) they are, however, always immoveable and transparent, and are situated in a most curious manner. All spiders have eight legs, which they employ in walking; and two shorter ones, called arms, used in seizing their prey. All the legs are thickly beset with hairs; each has six joints, and ends with two hooked claws, which are jagged on the inside. By means of this sort of teeth, in the claws, they seize very fast hold of their prey. Besides these weapons of attack, nature has furnished this creature with a pair of sharp, crooked claws, or forceps, in the forepart of its head. These are placed horizontally or crosswise, and when not exerted for use, are concealed"

concealed in two cases, contrived for their reception, in which they fold like a clasp knife, and there lie between two rows of teeth, which are likewise employed to hold fast the prey ; so that a poor fly has not the least chance of escaping the jaws of such a well-armed, formidable enemy.

HENRY.

Pray, mamma, lend me your microscope, that I may examine every spider I find.

MRS. HARCOURT.

You are welcome to the use of it, provided you are careful not to break it. Mr. Lewenhoeck, who has made microscopic objects his peculiar study, has computed, that one hundred of the single threads of a full-grown spider, are not equal to the diameter of the hair of his beard ; and consequently, if the threads and hair be both round, ten thousand of such threads are not bigger than such a hair. He calculates, that when young spiders first begin to spin, four hundred of their threads are not larger than one which is of a full growth. Allowing this to be fairly stated, four millions of

a young spider's threads are not so big as the single hair of a man's beard.

AUGUSTA.

Astonishing minuteness ! Since you say it is ridiculous, I will endeavour to overcome my aversion to spiders.

MRS. HARCOURT.

We are going from home for a few weeks. By the time we meet again, I flatter myself you will have availed yourself of my advice on many subjects ; and that I shall find you improved by the exertion of your reason, in the correction of any foibles you may have. Your young friends will think the separation tedious, but you will enjoy each other's company the more for this little interruption. Adieu, my dear child, may you enjoy health and happiness till our next meeting.

CONVERSATION XIV.

MRS. HARCOURT.

PARTICIPATE the general pleasure at being again assembled, after so long an absence, to renew those pleasing and instructive conversations, in which we have passed so many agreeable evenings. During our separation, our time has not been spent idly; we have attentively examined the different objects we have met with on our journey; and each one of us has collected observations on some particular subject, in order to furnish materials for new entertainment. My dear Augusta, how have you amused yourself since we have been absent? Have you added to your stock of knowledge by fresh acquisitions; or have you employed your time in perfecting yourself in those branches of science already begun?

AUGUSTA

AUGUSTA.

No one has so much reason to rejoice at your return, my dear Mrs. Harcourt, as myself. I have indeed deeply lamented your absence; for without a guide, or a companion, what pleasure is there in pursuing improvement? Summer is a season that tempts one abroad. I have walked a great deal, and in some of my rambles have availed myself of your directions, to become acquainted with the nature of plants and flowers. I have learned the names of the different parts that compose them; and, if Sophia will give me her kind assistance, I hope, in time, to become a botanist.

SOPHIA.

You cannot propose any thing more agreeable to me, than that we should pursue this delightful study together. Our walks will become more interesting, by having a particular object in view. Every step we advance will supply new entertainment; from the humble moss that creeps upon the thatch, to the stately oak that adorns the forest.

CHARLES.

Gently, Sophia; you must not obtrude upon the subject I have chosen. The humble moss, and its diminutive companions, I willingly relinquish to your claims; but the stately oak, and its attendant forest trees, I have selected, as suitable to amuse this company with; and though I readily resign any thing to you, that merely concerns myself, I cannot give up the only theme that I am prepared to speak upon.

SOPHIA.

Lay aside your apprehensions, brother. I shall have too much pleasure in hearing you explain their properties and uses, to desire to interrupt you. If my father has not provided any thing for this evening, may we not be favoured with your observations? I dare say we are all desirous of hearing them.

MR. HARCOURT.

Charles has made so good a choice, that you cannot be more agreeably amused than by attending to what he has collected on this subject. The beauty and utility of forest
trees

trees are so obvious and striking, that the most careless eye must be sensible of them. Charles, begin by telling us which are the principal trees used for timber.

CHARLES.

Oak, elm, ash, beech, poplar, walnut, chesnut, fir, and service tree, but they all yield to the oak, as well in beauty of foliage, as in the utility and duration of its timber. This noble tree forms our navies and cities: and should the cultivation of it be neglected, we may vainly deplore the loss of those wooden walls, that have so long been our pride and defence.

HENRY.

I do not understand what you mean by that expression. I thought walls had always been built of brick or stone.

CHARLES.

I ask pardon for making use of a figurative term. The naval strength of our island is frequently called its wooden walls, and consequently depends very much upon the cultivation

vation of the best species of timber. Every part of the oak has its use: the body is sawed into planks, to build ships and houses with; shingles, pales, laths, coopers' work, and wainscot, are made of oak; its wood is the most excellent for all works that require strength and duration. The bark is used by the tanner and dyer, to whom the very sawdust is useful. The ashes and lye are made use of for bucking of linen, and to cleanse and purify wine. The roots are formed into handles for daggers, knives, &c. Its fruit, the acorn, supplies food for deer and hogs; and when bruised, all kinds of poultry will thrive on it. Man, before the cultivation of corn, fed on acorns; and in times of scarcity they may still prove a valuable substitute. Different parts of the oak are used in medicine; they are all of an astringent, binding quality. The wood of this tree is the least adapted to works that require to be glued together, as it will not easily adhere, either with its own kind or any other wood.

CECILIA.

Is not ink made of oak galls? What part of the tree are they?

CHARLES.

Yes, they are used in making ink, as well as in the composition of various medicines. Neither the oak-apples nor the galls are any part of the trees: they are formed by insects, which deposit their eggs in the stem or leaf. There are various kinds of galls, formed by different insects, the inhabitants of a great variety of trees and shrubs.

MRS. HARCOURT.

The history of galls is so curious, that I cannot resist relating some particulars concerning them. Among the smaller insects, there are many which, either in the whole state of the worm, or during some of the changes they undergo, are of so tender and delicate a structure, that they cannot bear the contact of air; and others that are continually exposed to the ravages of a number of destroyers. Provident nature, in order to their preservation, has allotted them the galls of
trees

trees and plants for an habitation. Instinct directs them to make them for themselves; for they never find these excrescences ready formed. Some of these insects are produced from eggs, laid by their parent animal on the stalks of leaves, and as soon as they are hatched, make their way into the leaf or stalk, and find a safe lodging in this recess, and suitable food in its juices. Others are inserted by the mother fly, even in the egg state, within the substance of the trees and branches. The parents of these are a peculiar race of flies, supplied with an instrument at the end of their tails adapted for this purpose.

CECILIA.

How wonderful is the order of nature! the formation of the smallest insect, did we but know the purpose of its different parts, would furnish us with subject of admiration.

MRS. HARCOURT.

The galls produced by different insects have a very different internal structure. Some of them have only one large cavity, in which a number of the animals live in community:

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U

others

others have several small cavities, with communications between each; and others have different numbers of little cellules, each separate: and, finally, there are others in which there is only one cavity, inhabited by one insect. The inhabitants of these two last kinds live in perfect solitude during the worm state, and can have no knowledge of any other living creature, till they have passed through the intermediate state of chrysalis, and become winged animals, like those to which they owed their origin, and are ready, in their turn, to lay their eggs, and provide for the security of their future offspring. The variations in the different kinds of galls are not confined to their structure merely; each species has its peculiarity. Some of them are so hard, that they equal the hardness of the wood they grow upon; and when cut open, appear to be composed of films much more densely and closely arranged than those of the wood itself; others are soft and spongy, and resemble some of the tender fruits in appearance. The first kind are called gall-nuts, and the

the latter apple-galls, or berry-galls: many of them are beautifully coloured, and are very useful to the dyer, as well as the physician. The kermes is the most valuable of them all, and produces a scarlet dye, which is more durable than brilliant. It would take up too much time to mention the various particulars of each species. Charles, resume the subject of the oak.

CHARLES.

There are many varieties of this useful tree: the different parts of each are capable of being turned to some advantage. Cork is the bark of a species of the holm oak. It grows in great abundance in Spain, Italy, France, &c. Depriving this tree of its bark does not injure it; for if timely care be not taken to strip it off, it splits and peels off of itself, being pushed up by another bark formed underneath. In order to prepare it for use, it is piled in heaps, in ponds or ditches, then flattened with weights, and dried. It is principally applied to purposes to which its peculiar quality of repelling moisture is adapted; such as soles

for shoes, corks for bottles, and bungs for barrels. Waistcoats for swimming have also been made of it ; its excessive lightness rendering it suitable for the purpose, as well as its power of repelling the water.

MR. HARCOURT.

The bark, or exterior covering of trees, is not only useful to man for various purposes, but it is formed for the preservation of the trees also : it defends them from external injury, and preserves them from the cold, when it is too severe for their tender bodies. The reason that evergreens retain their leaves during the rigours of winter, is, because their barks are of a more oily quality than the bark of other trees. There are a great many kinds of barks in use in the several arts. They are considered as powerful restoratives and strengtheners in medicine. The bark of the alder is used in dyeing : that of a peculiar species of birch, is converted by the Indians into canoes, capable of holding twenty persons. A kind of rope is made of the bark of willows and linden-trees. The bark of the cocoa-tree forms the
cordage

cordage of the Siamese, and most of the Asiatic and African nations. In the East Indies they manufacture the bark of a certain tree into a kind of stuff or cloth. It is spun and dressed much after the manner of hemp: indeed flax and hemp, with all their toughness, are only the sap-vessels, or ligneous films, of the bark of those plants. The East-Indian thread, produced from bark, is of a middle kind, between silk and common thread: they sometimes manufacture it alone; at others, mix it with silk, as in ginghams, &c.

SOPHIA.

The ancients wrote their books on bark, before the invention of paper; particularly on those of the ash and lilia, or lime-tree. The outer bark was not suitable for this purpose; they made use of the inner and finer, called *phylyra*.

MR. HARCOURT.

And so durable was its texture, that there are manuscripts written on it still extant, a thousand years old. Bark is also serviceable as a manufc.

HENRY.

Papa, I think you told me, some time ago, that birdlime was made of the bark of the holly.

MR. HARCOURT.

Good boy, for remembering what you have been told. The usual method of preparing it is by boiling it a sufficient time. The roots of Hyacinths, asphodel, narcissus, and the black bryony, afford a tough, stringy juice, in great quantities, of the same kind.

MRS. HARCOURT.

I hope my Henry remembers also, that when he was told what materials composed birdlime, he was taught to despise its use. It is cruel and unmanly to deprive a poor bird of its liberty, merely to gratify our inclinations, without being able to improve the condition of the little sufferer. And it is to be feared that, when naughty, thoughtless boys have smeared the boughs with this substance, they have sometimes forgotten to return to the place and release the entangled prisoner, which,

which, by their cruel neglect and carelessness, has been left to starve.

CECILIA.

And it would be still more piteous were that prisoner a parent bird, its innocent little nestlings must suffer also a lingering death.

AUGUSTA.

My brothers have used birdlime, and set traps, without reflecting on the tortures they may have inflicted. I will repeat to them this conversation, and I am persuaded their hearts are too generous ever to be guilty of the same cruelty again.

CHARLES.

I shall next mention the elm, as second to the oak in size and beauty. It is particularly adapted to bear extremes of wet and dry, and therefore is frequently used for water-works, mills, pipes, pumps, aqueducts, &c. It is also suited to the purposes of the wheelwright. The fineness of its grain renders it fit for works of ornament, such as foliages, &c. In times of scarcity, when hay and fodder have been difficult to obtain, the dried leaves of the elm

elm have been substituted as food for cattle. Charcoal made of elm is inferior to none but that of oak.

SOPHIA.

‘If charcoal be made of wood, what process is used to transform it to that state.

MR. HARCOURT.

They begin the operation by clearing a circular piece of ground, of turf and other combustible matter. This space is filled with wood, cut into pieces of about three feet in length, and laid in the form of a pile, with a stake driven into the centre. The whole is covered over, moderately thick, with turf and other rubbish. After setting up a moveable screen against the wind, the stake is pulled up, and the pile set on fire, by pouring well-kindled coals into the cavity. The wood chars without being consumed, by properly regulating the vent-holes, and keeping the mass covered. It is chiefly useful where a clear, strong fire, without smoke, is required. Mathematical instrument makers, engravers, &c. find charcoal very serviceable in polish-

ing brass or copper-plates, after they have rubbed them clean with powdered pumice-stone. Charcoal and soot-black supply the painter and varnisher with the best and most durable black. One of the principal ingredients in making gunpowder is charcoal; but I do not mention this as an instance of its utility. Happy would it be for mankind, did peace and good will prevail among them so powerfully as to render such destructive inventions useless; but since this benign desire of universal harmony cannot be accomplished by the wishes of any one weak mortal, let each individual contribute his share towards preserving private peace, by subduing and regulating his angry passions, and cultivating and improving his benevolent dispositions.

MRS. HARCOURT.

You have omitted to mention the baneful effects of the fume of charcoal. There have been many instances of persons who have been shut up in close rooms with charcoal fires in them, that have been found dead in a few hours. Charles, you must bear our inter-

ruptions

ruptions with patience. You are now at liberty to proceed.

CHARLES.

I consider them as valuable additions to the few observations I have been able to collect ; nor could I go on, unless you and my father would condescend to assist me. The ash, next to the oak, is of most universal use. It serves the soldier for spears ; the carpenter, wheelwright, and cartwright, with ploughs, axle-trees, wheel-rings, harrows, and oars. It is useful to the turner, cooper, and thatcher ; and is superior to all other kinds for garden palisadoes, hop-yards, poles, and spars.

HENRY.

You told us that ships were made of oak ; but I cannot think that the body of an oak is either tall or straight enough to make the masts.

CHARLES.

The masts are made of fir or pine, which are tall, straight trees, adapted to the purpose. They love a chalky soil, and thrive well in a cold climate. Norway produces them in great abundance.

abundance. They form that kind of timber commonly called deal, which is so much in use for floors, wainscots, &c. It is supposed that the enormous wooden horse, introduced by the artifice of Ulyssus within the walls of Troy, and which was the means of destroying that famous city, after sustaining a siege of ten years, was formed of this tree.

MR. HARCOURT.

The pine and fir trees are not valuable for their timber only, but turpentine, pitch, rosin, and tar are made from them, by the following simple process. In the spring, when the sap runs most freely, they pare off the bark of the pine-tree, and cut a hole at the bottom to receive the sap. As it runs down it leaves a white matter, rather thicker than cream, which is substituted instead of white wax, in the making of flambeaux. The liquor that runs into the hole at the bottom, is ladled into a large basket: great part of this immediately runs through into stone or earthen pots, prepared to receive it, and forms the common turpentine. The thicker matter, which re-
mains

mains in the basket, is distilled with a large quantity of water, as long as any oil is seen swimming upon the surface of the water; which, when skimmed off, is common oil, or spirit, of turpentine. The matter that settles at the bottom of the still is yellow rosin. When they have obtained all they can from the sap of the tree, they cut it down, and hew the wood into billets, with which they fill a pit dug in the earth, and then set them on fire; whilst burning, there runs from them a black, thick matter, which is tar; if they desire to make it into pitch, they boil it without adding any thing to it, and the work is completed. Charles, continue your account.

CHARLES.

The turner uses the wood of the beech-tree, for dishes, trays, rims for buckets, trenchers, &c. The upholsterer forms it into chairs, stools, bedsteads, bellows, &c. The bark is used for floats for fishing-nets, instead of cork. It is very subject to the worm, which unfits it for purposes where duration is requisite; but various parts of it are applied successfully to
lighter

lighter uses. Bandboxes, scabbards for swords, and hat-cases, are made of the thin lamina, or scale, of this tree, and then covered with thin leather or paper. The mast or fruit fattens deer and swine; squirrels, mice, and dormice, greedily devour the kernels of the mast; and some of our most favourite singing birds, such as thrushes, blackbirds, &c. are preserved by them during the season that other food is scarce. The leaves, which afford an agreeable shade from the rays of the sun in summer, make the best and easiest mattresses, if gathered in autumn. Walnut is valued by the joiner and cabinet-maker for its beautiful variations of colour and grain, and is used in inlaid works.

MRS. HARCOURT.

Of late years the drawing-rooms of people of fashion have been furnished with tables curiously inlaid with wood of various kinds, and the use of mahogany much laid aside. This gives scope for the exercise of taste in the artist, who, when at a loss for a colour in the natural wood, suited to his purpose, unites

the art of colouring or staining it, to that of design: festoons of flowers, fruits, birds, &c. admirably executed, decorate the chairs and other pieces of furniture, in the place of the heavy gilding that adorned the state-rooms of our ancestors, who were more delighted with magnificence than elegance. The art of japanning and varnishing, which is now greatly improved, adds much to the beauty of painted or coloured wood. Substantial mahogany furniture is best suited to people whose rank and fortune subject them to the rules of useful œconomy, and whose duty it is to prefer utility to splendour and show. Sophia, do you recollect what country produces that species of cedar, the wood of which we call mahogany?

SOPHIA.

It is a native of the warmest parts of America, abounding in the islands of Cuba, Jamaica, and Hispaniola.

CHARLES.

There are many species of the cedar-tree; they were highly valued by the ancients for

their durability and beauty. Solomon's temple and palace were both built with it, which is a mark of its high estimation. They grow to a very great size, and thrive best in a poor soil. The chesnut-trees that grow out of the lava of Mount Etna, in the island of Sicily, exceed any I have heard of in magnitude. The agreeable traveller, Brydone, relates, that the most celebrated among these is called the *castagno de cento cavalli*; and that it measures two hundred and four feet round, though said to be united below in one stem, and is a mighty bush of five large trees growing together. The hollow of one of these is supposed to be capable of containing one hundred sheep.

MR. HARCOURT.

Woods and groves were held sacred through all antiquity. The Pagans generally built their temples in or near them; and the druids and bards, who were the ministers of religion among the ancient Britons, held them in the highest veneration. Particular trees were frequently consécrated among the Heathens to some favourite divinity. The laurel was devoted

to Apollo, who presided over poetry and the fine arts: hence, victors in the Olympic games, successful poets, and conquering heroes, have been rewarded with crowns of laurel. The myrtle was the favourite tree of Venus; and the vine appropriated to Bacchus. White poplar was used in the sacrifices to Jupiter; and the pine on the altar of Ceres. The Persian Magi burned their sacrifices with myrtle and boughs of laurel. The mythology of the Pagans extended the idea of the tutelary protection of woods and groves so far, as to believe that they were generally inhabited by dryads, or wood nymphs.

MRS. HARCOURT.

I am not surprised that minds uninstructed in the principles of true religion, impressed only by enthusiastic notions of the Deity, should be affected by the appearance of awe and solemnity that is felt on entering a thick, impervious shade. Milton, in his *Il Penseroso*, seems sensible of the alliance between the gloom of a tall forest and melancholy enthusiasm. He says,

Me, Goddess, bring
To arched walks of twilight groves,
And shadows brown that Sylvan loves,
Of pine, or monumental oak,
Where the rude axe, with heavy stroke,
Was never heard the Nymphs to daunt,
Or fright them from their hallow'd haunt ;
There in close covert, by some brook
Where no profaner eye may look,
Hide me from day's garish eye, &c.

CHARLES.

At the time of the Norman conquest, and for many years after, prodigious tracts of land in this island remained covered with forest trees and underwood ; they were not suffered to be cleared for the purposes of cultivation, lest the game, which took shelter in them, should be destroyed. Hunting was a favourite diversion with the kings and great men of that age ; and they unfeelingly sacrificed the public welfare to their own private gratification.

MR. HARCOURT.

As the number of the inhabitants increased, agriculture gradually increased. The great

power of the barons being diminished, the people at large became of more consequence, and it was found necessary to listen to their importunity, and convert some of these extensive royal forests into smiling corn-fields, the harbingers of comfort and plenty. It will be happy if the present generation do not run into the opposite extreme, and by neglecting the planting and preserving of timber, subject this country to the inconvenience and disadvantage of being supplied from a foreign market. Indolence, the love of present advantage, and want of attention to the good of posterity, are obstacles to the improvement and practice of this useful part of husbandry. Country gentlemen of fortune, who have leisure, and money to advance, can hardly render their country a more acceptable service than by raising valuable plantations of the best kinds of timber for the use of succeeding generations. This reward must consist in the patriotism and benevolence of their intentions, and in the increasing value of their estates; as the period of the life of man gives no ex-

pectation of the planter enjoying the fruit of his own labour, an oak not arriving at perfection much short of a century. Charles, you must oblige us with a further account of this interesting subject to-morrow evening. The time of separation is arrived. Adieu, my dear children.

CONVERSATION XV.

On Forest Trees, continued.

AUGUSTA.

I HOPE I am not too late. I was so impatient to hear a continuance of last night's conversation, that I hastened tea, in order to be here early.

MRS. HARCOURT.

The same inclination seems to have drawn each of us here rather earlier than usual;

pleasing

pleasing assurance that our lectures are not tedious, but that our attention is rather voluntary than constrained.

MR. HARCOURT.

Instruction should always be rendered agreeable, in order to be beneficial to those that are to learn. The skill of a preceptor consists in gaining the affections of his pupils, and conveying knowledge in so gradual and clear a manner as to adapt it to the strength of the young student's capacity. Many a poor child has been disgusted with books and learning, by the heavy, laborious tasks that have been given him to learn by heart, before he was capable of understanding them. The spirit of improvement, that distinguishes this enlightened age, shines in nothing more conspicuously than in education. Persons of genius have not thought it unworthy of their talents to compose books purposely for the instruction of the infant mind; and various ingenious methods of facilitating the acquisition of knowledge have been invented.

MRS.

MRS. HARCOURT.

The austere manners of former times secluded children from the advantage of conversing with their parents or instructors : an unnatural distance was maintained between them ; they were seldom admitted into the parlour, but to pay a ceremonious visit. The great Duke of Sully relates, in his Memoirs, that his children were never suffered to sit at table, in his presence, on chairs with backs to them. The times are greatly altered in this respect for the better, and the familiar intercourse that is now maintained with young people, by their parents and those who preside over their education, affords them an agreeable opportunity of enlarging their minds, and attaining a fund of knowledge, by the easy medium of conversation. The liberality, with which young persons are treated in the present times, promises still greater hopes of advantage in the culture of the heart and disposition, than in the improvement of the faculties, by substituting

rea

real affection and friendship, in lieu of that distant respect which is only the shadow of it.

SOPHIA.

I flatter myself that there is not one of us who is insensible to the privileges we enjoy, by the indulgence of our kind parents; particularly that of being permitted, nay, encouraged, to open our whole bosoms to them.

AUGUSTA.

Forgive me, if I almost envy you this unspeakable comfort. Deprived of a mother, before I was capable of knowing my loss, I have been a stranger to those tender sensations that unite the heart of a child to so dear a connection. My father, though extremely fond of me, is often obliged to leave me for months together, on account of business, to the care of a governess that I cannot love. Had I been so fortunate as to have been placed under such a woman as your Mrs. Selwyn, who treats you with kindness, is never angry without a cause, and spares no pains for your improvement, I think I should have regarded her as an adopted mother, and loved

her with equal tenderness; but the caprice, ill-humour, and indolence of Mrs. Marchmont, discourage me from endeavouring to please her: and had it not been for the compassionate attention of my dear Mrs. Harcourt, I must ever have remained ignorant and self-conceited, confirmed in error, a slave to bad habits and my unsubdued passions.

MRS. HARCOURT.

Your gratitude enhances the value of my friendship too highly. You are the daughter of my particular friend; and I can never feel greater pleasure than in paying a tribute to her memory, by doing you every service in my power. Charles, time passes swiftly: what tree do you begin with?

CHARLES.

I have finished my account of the principal trees used for heavy timber: the peculiar uses of the light sorts of wood remain for me to mention. Lime is used chiefly in carving, and for such purposes as pill-boxes, &c. The twigs are made into baskets and cradles, and all kinds of wicker-work. The inner bark
has

has been used instead of paper. A copy of one of Cicero's works, written on this bark, was preserved as a great curiosity in Cardinal Mazarin's library.

HENRY.

I have been often greatly amused by watching the basket-maker that lives in the village; he uses osiers as well as the twigs of the lime. The vast variety of things that he makes, with such simple materials, has surprised me. Sometimes I have sat down and worked with him: and were I to become very poor, I think I could easily follow his trade.

AUGUSTA.

Pray, what variety of things does he make? I cannot recollect any thing but baskets.

HENRY.

In the first place, baskets of various forms and sizes, flaskets, hamper:, cages, lattices, cradles, hurdles, wiers for fish, and many other things that I cannot remember. Hazel is the best for hurdles, fishing-rods, and spring to catch birds with.

CECILIA.

CECILIA.

Are not osiers a species of willow ?

CHARLES.

Yes, they are a kind of low willow, found by the water side ; the wood of the willow, of late years, is come into great demand for the purpose of making ladies' hats. It is cut into thin, narrow slips, by a machine, and woven into the form of a hat, which has a pretty effect. This kind of wood is suited to purposes that require elasticity. The elder, on the contrary, is adapted to uses that need toughness, such as butchers' skewers, &c. Almost every part of this tree has its medicinal use ; and pleasant-flavoured wine is made both from the flowers and fruit. Poplar is incomparable for all sorts of white wooden ware, as also for heels of shoes. The hardness of box, and readiness to take a polish, renders it very valuable to the turner for mathematical instruments, pegs, nut-crackers, weavers' shuttles, rulers, rolling-pins, pestles, tops, chess-men, screws, lace-bobbins, spoons, combs, &c. Holly affords

the whitest wood of any, and is used in making dressing-boxes, and other fancy works.

MR. HARGOURT.

Almost innumerable are the uses to which different parts of trees, growing in every temperature of the world, are applied. The bodies for timber; the bark, leaves, blossoms, fruit, gums, resin, manna, sugar, contribute to our accommodation, and are rendered, by art and ingenuity, subservient to our use. Some trees afford food; others poison: the fibres of some supply us with clothing; the timber of many with habitations: from some we extract medicines for the cure of our maladies; from others dyes of various hues: some are adapted to form musical instruments, by the sonorous quality of their wood, such as maple, fir, yew, and pear-tree; others, deficient in that property, compensate the defect by excellence of a different kind. Every tree has its peculiar property; and scarcely any but may be converted to useful purposes. Their branches afford a lodging to birds; their berries supply them with food; numerous insects

inhabit every part of them. Let us admire the wise œconomy of nature, that supports and nourishes one part of her works by the produce of another. The seeds alone of trees and plants feed a vast number of animals, and yet there are a sufficient number left for the purpose of preserving their respective kinds.

MRS. HARCOURT.

The fecundity of vegetables is equally amazing with that of fishes. Mr. Ray asserts that one thousand and twelve seeds of tobacco weighed only one grain, and that from one tobacco plant, the seeds thus calculated amounted to three hundred and sixty thousand. The seeds of the ferns are, by him, supposed to exceed a million on a leaf. This numerous reproduction prevents the accidental extinction of the species; at the same time that it serves for food for the higher order of animation. Nature has provided, in a wonderful manner, both for the nourishment and preservation of the immature seed. Every seed possesses a reservoir of nutriment, designed for the growth of the future plant;

this consists of starch, mucilage, or oil, within the coat of the seed; or of sugar and sub-acid pulp in the fruit which belongs to it. In order to preserve them from injury, some are wrapped in down; as the seeds of the rose, bean, and cotton plant: others are suspended in a large air-vessel, as those of the bladder-senna, staphylæa, and pea. Many are furnished with a sort of wing or feather, as those of the thistle and anemone, which assist their conveyance by the wind from one place to another. There is a great analogy between the seeds of vegetables and the eggs of animals and insects. They both include a perfect individual of their respective kinds, together with suitable nourishment to bring it to maturity, though the parts are far too minute for our investigation.

AUGUSTA.

Is it possible that so large a tree as that majestic oak, which we so often admire, could ever be contained in a small acorn?

MR. HARCOURT.

The fact admits of no doubt. In some

plants, the embryo is partly visible, by the assistance of the best microscopes; and as nature governs by general laws, it is fair to surmise that the other kinds are propagated in the same manner.

SOPHIA.

Vegetables produce their seed, or embryo young, unconsciously, and drop them on the ground, or suffer them to be wafted by the wind where accident directs. Insects show a higher degree of instinct, and deposit their eggs where they are likely to meet with food suitable to their different natures; and after providing for their future security, by placing them in a proper situation, die; or, if their short existence be extended beyond one season, leave them to be hatched by the sun, without further care. How superior is the parental solicitude of birds! After composing a habitation for the reception of the eggs, with much labour and ingenuity, with what patience do they confine themselves to the task of hatching them; they seem to have lost every desire for flying about; and sit, day after

after day, till the young brood is hatched : their cares are then of another kind ; they leave the nest, for a little while at first, to seek for food, which they distribute equally to their young ones. Their anxiety is continued till the nestlings are capable of providing for themselves, when they seem to forget their past affection, and wholly abandon the objects of their former tenderness to their own management.

MRS. HARCOURT.

Instinct, or that quality in animals which corresponds with reason in man, is bestowed on each creature in proportion to its rank or order in creation. The gradation of being is something like the links of a mighty chain, the immediate distinctions of which are scarcely perceptible ; but when we compare the mineral, vegetable, and animal kingdoms together, the superior excellence of the latter is obvious, as the lowest degree of animal life is above the highest vegetable production. Let us proceed still further, and make a comparison of the most inferior order of animals, such as oysters, &c. which seem only to possess a

bare existence, void of faculties of enjoyment, with man, a creature endowed with the noble quality of reason, capable of exercising very extensive intellectual powers, and enabled to understand, admire, and investigate, the works of his great Creator.

CECILIA.

I never was so sensible of my own dignity before.

MR. HARCOURT.

Beware, my dear child, of doing any action unworthy of a being of so exalted a rank, in the scale of existence; at the same time, learn humility, from the recollection, that it is rational to believe that there are degrees of intellectual beings as much above man as the oyster is below him.—We have strangely wandered from our subject. Charles, are you prepared to give us an account of the poison-tree, which you extracted from Dr. Darwin's notes on the Loves of the Plants?

CHARLES.

The upas-tree is situated in the island of Java. It is surrounded on all sides by a circle

of high hills and mountains ; and the country round it, to the distance of ten or twelve miles from the tree, is entirely barren. Not a tree, or a shrub, nor even the least plant or grass, is to be seen. The destructive effluvia that proceeds from the tree is supposed to be the cause of this sterile appearance. The poison which is procured from this tree, is a gum that issues out between the bark and the tree itself, like the camphor. Malefactors, who are sentenced to die for their crimes, are the only persons who collect the poison, and they are allowed this chance of saving their lives. After sentence is pronounced upon them by the judge, they are asked in court, whether they will die by the hands of the executioner, or go to the upas-tree for a box of poison. They commonly prefer the latter proposal, as there is not only some chance of preserving their lives, but also a certainty, in case of their safe return, that a provision will be made for them in future by the emperor. They are also permitted to ask a favour of the emperor, which is generally of a trifling nature, and usually granted.

They are then provided with a silver box, in which they are to put the poisonous gum, and are properly instructed how they are to proceed, while they are upon their dangerous expedition. They are told to pay particular attention to the direction of the winds, as they are to go towards the tree before the wind, so that the effluvia from the tree is always blown from them. They are likewise directed to travel with the utmost dispatch, as that is the only method of ensuring a safe return. They are afterwards sent to the house of an old priest, who lives on the nearest habitable spot, appointed by the emperor to reside there, for the purpose of preparing the souls of those criminals for eternity, who are sent to the tree, by prayers and admonitions. To this place they are commonly attended by their friends and relations. When the hour of their departure arrives, the priest puts them on a long leathern can, with two glasses before their eyes, which comes down as low as their breast, and also provides them with a pair of leathern gloves. Thus equipped, they are con-

ducted

ducted by the priest and their relations, about two miles on their journey. Here the priest repeats his instructions, and tells them where they are to look for the tree. He shows them a hill, which they are to ascend, and that on the other side they will find a rivulet, which will guide them to the upas. They now take leave of each other, and, amidst prayers for their success, the delinquents hasten away. Notwithstanding the precautions that are taken, there are scarcely two out of twenty that escape. It is certain that from fifteen to eighteen miles round this tree, not only no human creature can exist, but that, in that space of ground, no living animal of any kind has ever been discovered. Every man of quality has his dagger or other arms poisoned with the gum of this destructive tree; and in times of war, the Malians poison the springs and other waters with it: by this treacherous practice the Dutch suffered greatly during the last war, as it occasioned the loss of half their army. For this reason, they have ever since kept fish in those springs of which they

drink, and sentinels are placed near them, who inspect the waters every hour, to see whether the fish are alive. If they march into an enemy's country, they always carry live fish with them, which they throw into the water, some hours before they venture to drink of it; by which means they have been able, in some degree, to provide for their security.

SOPHIA.

This is a very extraordinary account. How happy is it for mankind that these baneful trees are not commonly found: so subtle and irresistible does their poisonous influence seem to be, that were they scattered in different places, they might destroy all animals and vegetables, and change this beautiful world into a barren waste.

MRS. HARCOURT.

The most useful and beneficial things are bestowed in the greatest plenty, which is an instance of the Divine Goodness, that calls for our daily gratitude.

AUGUSTA

AUGUSTA.

Of what use can the upas-tree be? Would it not be better if such trees had never been created?

MRS. HARCOURT.

The wisdom of the Almighty, in the order of the creation, and our limited capacity to judge of the good of the whole, is a sufficient reply to such questions. But perhaps such instruments of destruction are permitted, to make us sensible of our happy situation, and the many blessings we enjoy; at the same time, they serve as monuments of that power which can destroy a guilty world by a variety of means, and may have some influence to restrain the vices of those who are principally affected by sensible objects. The Caoutchouc, or Indian rubber, being the produce of a tree, some account of the manner of its preparation will not be foreign to the present subject. Cecilia will be kind enough to tell us something concerning it.

CECILIA.

It consists of a very elastic resin, produced

by a tree which grows on the banks of the river of the Amazons. It grows to a very great height, perfectly straight, having no branches except at top. Its leaves bear some resemblance to those of the manioc: they are green on the upper part, and white beneath. The seeds are three in number, and contained in a pod, consisting of three cells, not unlike those of the *palma Christi*; and in each of them there is a kernel, which being stripped and boiled in water, yields a thick oil or fat, which the natives use for the same purposes that we do butter. The juice, which is applied to many different uses, is collected chiefly in time of rain, because it flows then most abundantly. They make an incision through the bark, and there issues from it a milky liquor. It is said, that the means employed to harden it is kept a profound secret; though some assert, that it thickens, and becomes gradually solid, by being exposed to the air. As it becomes solid, it shows an extraordinary degree of flexibility and elasticity. The Indians make boots of it, which water cannot penetrate. They have a

method of smoking them, that makes them look like real leather. Bottles are also made of this substance, to the necks of which are fastened hollow reeds, so that the liquor that is contained in them may be squirted through the reeds by pressing the bottle. One of these, filled with water, is always presented to each of their guests at their entertainments, who never fails to make use of it before eating.

HENRY.

How I should laugh to see a company of people squirting water at each other.

MRS. HARCOURT.

There are various customs in different countries, that appear strange and unaccountable to the eye of an unprejudiced stranger, and seem to have arisen from caprice or accident. Habit renders us insensible to the absurdity of those we see constantly practised. Is it not as reasonable to wish health and happiness to our friends, at every mouthful we eat, as at every glass we drink?

HENRY.

It might be quite as reasonable ; but it would

MRS. HARCOURT.

Civility requires that a traveller should comply with the customs of the country through which he passes, provided they be perfectly harmless and innocent. Cecilia, continue your account of the caoutchouc.

CECILIA.

Flambeaux made of this resin give a brilliant light, and have no bad smell. A kind of cloth is also prepared from it, which the inhabitants of Quito apply to the same purposes as our oil-cloth or sail-cloth. It is also formed into a variety of figures, by means of earthen moulds, that serve both for use and ornament.

MR. HARCOURT.

Ever since this resin has been known in Europe, its chemical qualities, and other interesting properties, have been very diligently investigated. Its solidity, flexibility, and elasticity, added to its quality of not dissolving in water, spirits, oils, or salts, render it extremely fit for the construction of tubes and other instruments, in which these properties are wanted. You have all experienced its usefulness in
drawing,

drawing, by erasing the erroneous strokes of blacklead pencils, which has occasioned many to call it lead-eater. Were we acquainted with the different properties of all the forest-trees that grow in the various climates of the earth, the subject would be almost inexhaustible, and would furnish us with new matter of admiration of the power and wisdom that formed them, and endued each with its peculiar distinction. Of those that are known, we have only mentioned the most obvious and striking, and such as we are familiar with by name, from using their productions. Children, recollect whether you cannot enrich our list, by adding an account of any trees, remarkable for their produce or beauty, which Charles has forgotten or omitted.

SOPHIA.

The nutmeg-tree is found in the East-Indies, and is said to resemble a pear-tree. The fruit is enclosed in four covers; a thick fleshy coat, something like that of the walnut, contains the whole, which opens of itself when ripe: under this lies a thin reddish kind of net-work, of an

agreeable smell and aromatic taste, which we can mace, and is as valuable as the fruit itself. The shell is the third covering, and is hard, thin, and blackish : under this is a greenish film, of no use, and in it is found the nutmeg. According to Tavernier, birds are the instruments of propagating these trees, by eating the nutmegs, and afterwards dropping them, undigested, upon the ground, and being softened and prepared for growth by the heat of the stomach, they readily take root. These birds are not permitted to be killed, on account of this circumstance, as the productions of this tree afford a very lucrative branch of commerce to the Dutch East-India Company, who monopolize the spice-trade, and by that means render it very profitable. Nutmegs and mace give an elegant flavour to high-seasoned dishes, and are frequently used in medicine.

AUGUSTA.

I have seen and used the different kinds of spices, without ever reflecting on their nature ; are cinnamon and cloves also the produce of trees ?

SOPHIA.

Cinnamon is the bark of a tree, chiefly growing in the island of Ceylon; and cloves are the fruit of a tall tree found in different parts of the East-Indies.

MRS. HARCOURT.

The tropical climates far excel those that approach near the Poles, in the beauty of the feathered race; their colours are more vivid, and dazzle with a richness and brilliancy that the inhabitants of our groves are not adorned with; but, as if Nature took delight in dividing her gifts, they are deficient in the variety and extent of their tuneful powers, and must yield to the superior music of our warblers. In the vegetable productions they rise above us also in magnitude, luxuriance, and fragrance. The groves of pimento-trees, in the West-Indies, fill the air with their odours: their fruit is a small berry, which we call allspice, because it partakes of the flavour of many of the spices of the East. The pimento refuses the culture of man, and flourishes best when it grows spontaneously. It is a tree of

great beauty. The trunk is of a grey colour, smooth, and shining; it produces beautiful white flowers, which blow in the months of July and August. The leaves are equally fragrant with the fruit, and yield an odorous oil, which, when distilled, frequently passes for oil of cloves.

SOPHIA.

Dr. Hawkesworth relates that the bread-fruit is found in Otaheite, in the South Sea, on a tree about the size of a middling oak. It is as large as our gourds, and the surface covered with a kind of net-work. The eatable part lies between the skin and the core: it is as white as snow, and of the consistence of new bread. It has an insipid, sweetish taste, resembling that of the crumb of wheaten bread, mixed with a Jerusalem artichoke. It is roasted and baked before it is eaten, and admirably supplies the place of bread, to a people ignorant of the arts of cultivation.

CECILIA.

I must not suffer my favourite mulberry-tree to be forgotten. When adorned with the yellow

yellow cones of the silk-worm, like so many balls of gold, I think its appearance must equal the beauty of any you have mentioned: and we owe to the insect it nourishes and maintains, the most delicate and agreeable texture that we wear; therefore, you must allow that it is inferior to few in usefulness.

MR. HARCOURT.

Cecilia is determined to defend her favourite with spirit; and indeed she has done it ably; for without the mulberry-tree, we must relinquish the use of silk, so well adapted to the clothing the inhabitants of warm climates, and which contributes so much to the elegance and magnificence of dress and furniture in all other countries where it is known. But, my dear children, where time is spent agreeably, it also passes swiftly. Our hour of separation is already past. Let us retire, and seek that repose which is necessary to refresh our weary spirits, and invigorate us for the pursuits of to-morrow.

END OF VOL. I.

